Construction Methods and Equipment

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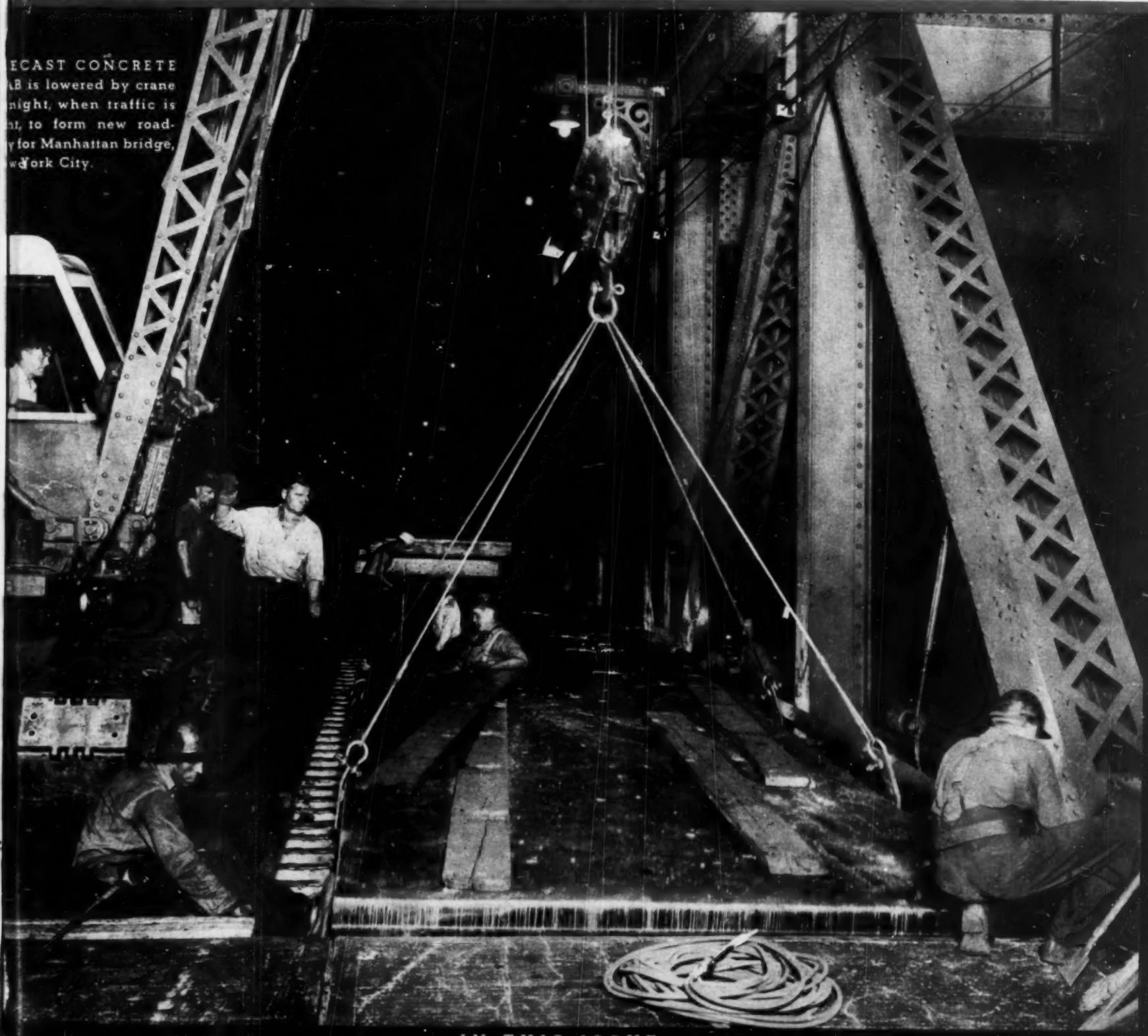


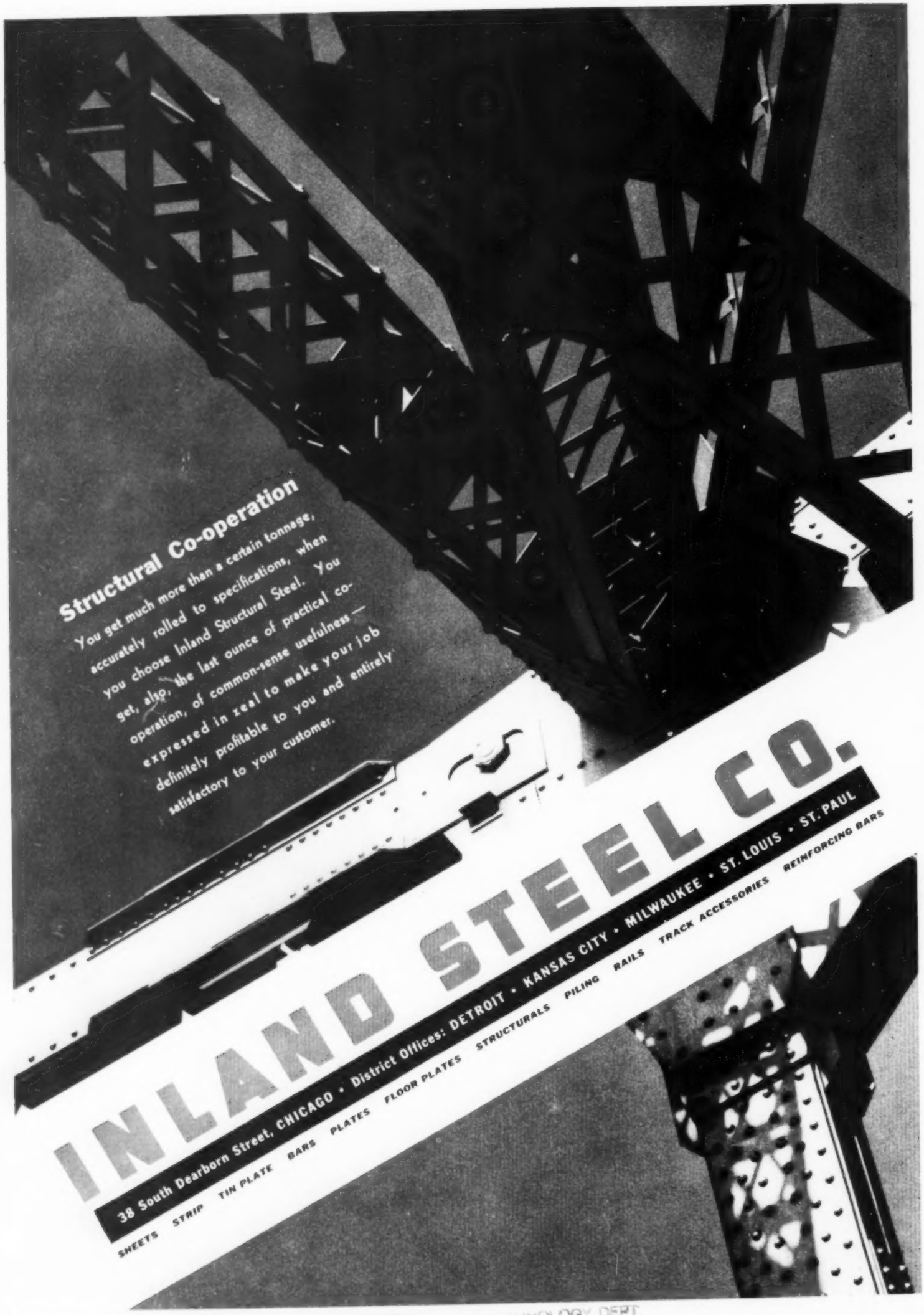
ECAST CONCRETE
AB is lowered by crane
night, when traffic is
ht, to form new road-
y for Manhattan bridge,
w York City.

IN THIS ISSUE

Is the Building Industry Awake?

By J. A. TURNER
Vice-President, Turner Construction Co.

Manhattan Bridge Roadway Repaved With Precast Slabs



CURRENT JOBS

. . . . and Who's Doing Them

BUILDINGS

Public—At Terre Haute, Ind., **Great Lakes Construction Co.**, of Chicago, received $2,158,277 contract for federal penitentiary. For a slum clearance project in Louisville, Ky., involving a total of $2,225,598, contract lets included $1,089,869 to **G. H. Rommel Co.**, of Louisville; $719,948 to **Whittenberg Construction Co.**, of Louisville. A $1,006,056 federal jail in Denver, Colo., went to **T. Bate & Sons**, local contractors. Successful bidder for Governor's office in Richmond, Va., was **Luck & Black, Inc.**, of Richmond, with price of $1,500,000. A federal jail in Danbury, Conn., will be built for $1,276,432, by **E. J. Rappoli Co., Inc.**, of Cambridge, Mass. The Syracuse (N.Y.) Housing Authority let contract for $1,110,225 to **W. L. Crow Construction Co.**, of New York, for a housing development. Low bidder on structural steel for criminal courts building, New York City, was **Bethlehem Steel Co.**, with tender of $1,343,100. Indiana University, Bloomington, Ind., has engaged **C. H. Shook, Inc.**, of Dayton, Ohio, to construct buildings costing $963,942. In Texarkana, Tex., **R. F. Ball Construction Co.**, of Fort Worth, Tex., will build a $865,400 federal correction institute. Marine barracks on Parris Island, S. C. to cost $897,570 are under construction by **J. A. Jones Construction Co.**, of Charlotte, N.C. **Mion Construction Co.**, of Atlanta, Ga., is building a $752,932 state capitol building in that city. For a hospital in Chicago, **Simpson Construction Co.**, of that city, bid $749,850.

Commercial—For the Chatham Park housing development in Chicago, **R. G. Regan Co.**, of Chicago, is engaged on a $3,288,000 contract. Park Terrace apartments, in New York City, to cost $2,250,000, will be built by owner, **Park Terrace Apartments, Inc.**, At Hollis, L. I., N. Y. a $2,250,000 housing project known as Hillside Park Gardens, is under way by **Kurland & Goldberg**, of Hollis. **Junaid Construction Corp.**, of Rockville Centre, N. Y. is engaged on a $2,000,000 housing project in that community. Apartment buildings to cost $1,400,000 are under construction in Minneapolis, Minn., by **W. Butler Co.**, of St. Paul.

Industrial—Successful bidder for a $3,750,000 newsprint mill in Lufkin, Tex., was **Merritt, Chapman & Scott Corp.**, of New York City. A $500,000 plant for the Continental Can Co., at Oil City, Pa., will be built by the **Austin Co.**, of Cleveland. **G. W. Kane**, of Durham, N. C. is engaged on a $500,000 tobacco plant structure in that city.

Next Month:

ANNUAL ROAD BUILDERS' NUMBER

•

Appearing on the eve of the thirty-sixth convention of the American Road Builders' Association, to be held in San Francisco, March 7-10, the February issue of CONSTRUCTION *Methods and Equipment* will present in text and pictures specific examples of improved methods and equipment for highway construction.

There will also be articles on the timely subject of Public and Employee Relations in the highway field.

DAMS AND EARTHWORK

Low bidder for Upper Narrows Debris Control dam on Yuba River, Calif., was **Arundel Corp.**, of Baltimore, with price of $3,165,037. For Mahoning dam, in Pennsylvania, low bid of $2,646,610 was received from **Dravo Corp.**, of Pittsburgh, Pa. For removing material from Intracoastal waterway, S.C., low bid of $919,333 was received from **W. S. Rae**, of Pittsburgh. Tunnels on Provo River reclamation project in Utah, went to **G. K. Thompson Co.**, of Los Angeles, for $746,356. Jetty project at Toledo, Ore., was bid in for $628,425, by **Kern & Kibbe**, of Portland, Ore., **United Concrete Pipe Corp.**, of Los Angeles, bid $598,674 for earthwork tunnels and railroad crossings of Sacramento River at Delta, Calif.

WATERWORKS

For section of New York City's Delaware Aqueduct tunnel contract for $11,431,975 went to **Dravo Corp.**, of Pittsburgh, Pa. Boston's Metropolitan Water Dist., received bid of $4,164,126, for concrete pressure pipe from **Lock Joint Pipe Co.**, East Orange, N. J.; on the same project, **West Construction Co.**, of Boston, Mass., bid $3,197,000 for the Southboro tunnel. Water mains in Pittsburgh, Pa., will be laid by **D. Dinardo**, local contractor for $635,000. Paris, Ark., has engaged **S. E. Evans Construction Co.**, of Fort Smith, for waterworks improvements to cost $163,887.

In Fort Wayne, Ind., **Bass Engineering & Construction Co.**, of Detroit, will build a $760,280 sewer interceptor. In Boston, Mass., **V. Barletta Co.**, of Rosindale, Mass., has started work on a $695,523 sewer contract. For a $580,644 sewage system in Gretna, La., successful bidder was **Drainage Construction Co.**, of Dallas, Tex., Sewage disposal plant in Meriden, Conn., went to **F. H. McGraw & Co.**, of Hartford, for $402,000.

Construction Methods and Equipment

330 West 42nd St., New York

H. W. CLARKE, Vice-President

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JANUARY, 1939

ROBERT K. TOMLIN, Editor
A. E. PAXTON, Manager

Editorial Staff: Vincent B. Smith, Paul Wooton (Washington), Nelle Fitzgerald

A McGRAW-HILL PUBLICATION

The "How" of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

•

CONSTRUCTION Methods and Equipment was founded in 1919, under the name of SUCCESSFUL METHODS, by the Manufacturers' Publicity Bureau, Inc., of Chicago, representing a group of non-competing manufacturers of construction equipment. Charles R. Thomas, editor of the first few issues, was succeeded by William Jabine.

In 1926 the McGraw-Hill Publishing Company, Inc., of New York, purchased the publication, changing its name to SUCCESSFUL CONSTRUCTION METHODS in November of that year, to CONSTRUCTION METHODS in May, 1927, and to CONSTRUCTION Methods and Equipment in December, 1936, in order more accurately to define its field and purpose. All rights to the foregoing titles are reserved by the publishers.

Robert K. Tomlin was appointed editor of CONSTRUCTION METHODS in January, 1928. Vincent B. Smith is associate editor; Nelle Fitzgerald, assistant editor; and Paul Wooton, Washington representative.

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McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

JAMES H. McGRAW, Founder and Honorary Chairman

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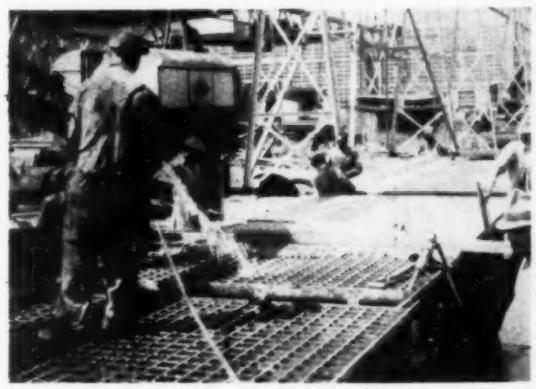
"Will you please get off my foot?"

"The boss says we can lean on each other till the new shipment of shovels arrives!"

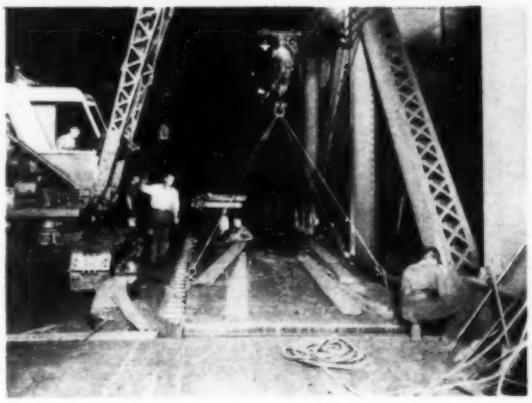
"Oh boy, double feature today, look!"

"By golly, that reminds me—I'm supposed to meet my wife after work!"

"PRESTO! A NEW BRIDGE DECK"



1 Grid-reinforced slabs each 9′ x 18′ 10″, 4″ thick, weight 6½ tons, were precast by Harris Structural Steel Co., New York, and came to job complete with steel stringers, ready to set on bridge girders.



2 Below-deck steel was cut during the day; at night, the old wood-block floor was torn out and slabs set in place. 188,000 sq. ft. of roadway replaced without traffic tie-up.

3 New deck in use. Slabs were cast under strict control; specified 7-day strength, 4000 lb.; actual average, 4400 lb.

'INCOR' USED IN PRECAST CONCRETE SLABS FOR NEW YORK'S MANHATTAN BRIDGE

"Presto! A New Bridge Deck" — reads a newspaper headline, reflecting public appreciation at the speed and efficiency with which the old wood-block roadway of New York's Manhattan Bridge over the East River was replaced with grid-reinforced concrete slabs. The entire 35′ roadway, 6370′ long, was re-built in four months — without traffic delay.

Typical of sound engineering employed by the Department of Public Works of the City of New York in successfully achieving the three-fold objective of increased public convenience, greater safety, and reduced maintenance costs.

Why 'Incor' Concrete Was Used

Based upon its 12-year record on highways and bridges — and especially on its performance under 103,000-car-a-day average traffic on New York's Queensboro Bridge — 'Incor' 24-Hour Cement was used for precast units on Manhattan Bridge.

'Incor' saves money through dependable high-early-strength and reduced curing time. That means better concrete at lower cost on many jobs. It pays to figure every job with both Lone Star and 'Incor'.* Then, let economy decide which cement to use. Write for copy of "Cutting Concrete Costs." Address Lone Star Cement Corporation, Room 2261, 342 Madison Avenue, New York, N. Y.

*Reg. U. S. Pat. Off.

LONE STAR CEMENT CORPORATION

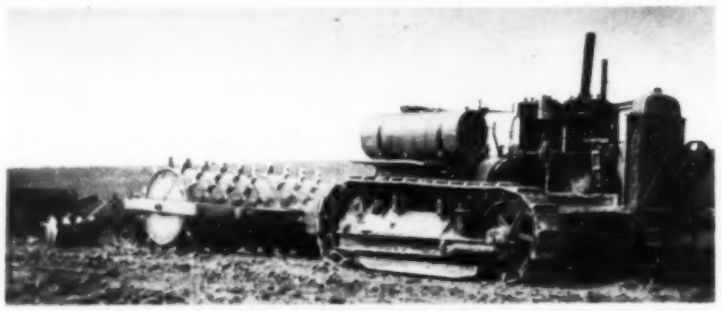
MAKERS OF LONE STAR CEMENT · · · 'INCOR' 24-HOUR CEMENT

Close-figuring Contractor

GIVES CREDIT TO LUBRICATION

THIS BUCYRUS-ERIE SHOVEL *is powered by a Caterpillar Diesel, lubricated with Texaco Ursa X Oil.*

TEXACO URSA X *lubricates this Caterpillar Diesel. The gears are lubricated with Texaco Crater Compound.*



ALL FITTINGS *on all W. J. Sheppard's equipment get Texaco Marfak. And all gasoline engines in his Mack Trucks are fueled with Texaco* Fire-Chief.

SUCCESSFUL BIDDING DEMANDS equipment that keeps going, day and night. Contractor W. J. Sheppard of Chicago, Illinois, avoids delays by using Texaco Lubricants 100%.

Read the captions for the three illustrations. Then you will realize that Texaco Lubricants can help you, too.

Trained lubrication engineers will help you select suitable Texaco Lubricants. To order, phone the nearest of 2186 warehouses, or write directly to: The Texas Company, 135 East 42nd Street, New York City.

Texaco Dealers invite you to tune in The Texaco Star Theatre —a full hour of all-star entertainment—Every Wednesday Night—Columbia · Network—9:00 E.S.T., 8:00 C.S.T., 7:00 M.S.T., 6:00 P.S.T.

TEXACO Marfak

LASTS TWICE AS LONG AS ORDINARY GREASE

Rubber Mounted..

Here's frame construction that "means business" and stays "put." Note the six cushioned points . . . resilient rubber sleeves and rubber blocks that carry the load and serve as shock absorbers against terrific loading impacts.

. . . for LONGER LIFE and LOWER MAINTENANCE COSTS

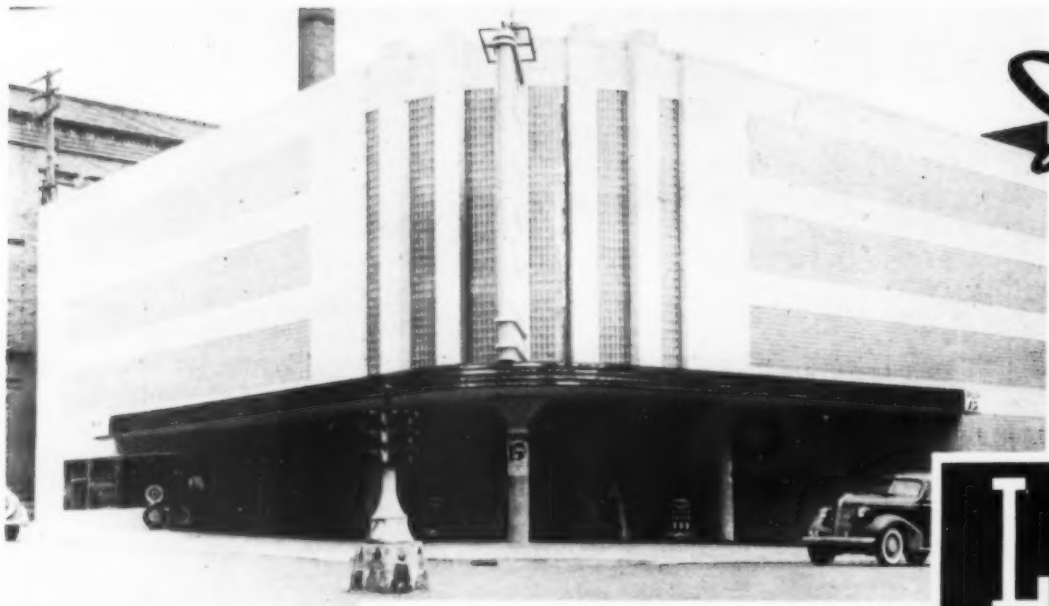
An Exclusive TRAC-TRUK Feature of Specific Advantage on *Heavy Haulage Work*

Cushioned and Stabilized on rubber . . . only Trac Truks offer this exclusive advantage. It means the elimination of rear spring maintenance expense and provides for increased stability with adequate cushioning of loading and hauling impacts. This rugged unit is engineered and built to meet the demands of all types of heavy-duty work. It has extra capacity for big loads . . . with greater average speeds. You'll find these Rear-Dump Euclid Trac-Truks cutting hauling costs in mines and quarries . . . on highway construction, industrial projects, dams and levees. Get the complete story on how Trac-Truks Excel on Cycle-Time Production. Compare their performance with what you are getting from your present equipment. Your inquiry will bring the facts.

Going strong after a solid year of grueling service on new highway construction between Cornwall and Highland Falls, N. Y.

EUCLID
THE PIONEER

THE EUCLID ROAD MACHINERY CO.
CLEVELAND, OHIO U. S. A.
BRANCH OFFICE 185 EAST BUTLER AVENUE, MEMPHIS, TENN.

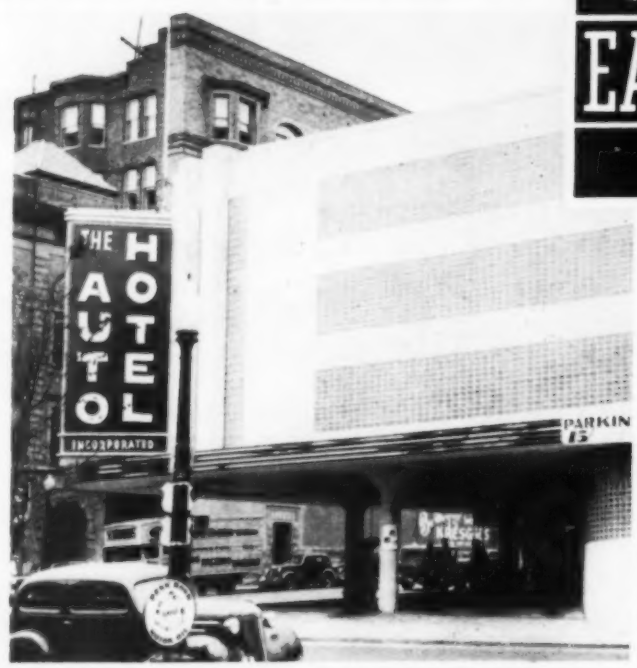


During COLD weather

LEHIGH EARLY STRENGTH CEMENT

Saved $1580.00

Auto Hotel, Inc., Bloomington, Ill. Contractor: John Felmley Co., Bloomington, Ill. Architect: Schaeffer & Hooton, Bloomington, Ill. The use of Lehigh Early Strength Cement for the first two floors of this unique reinforced concrete structure expedited the entire job—effected economies and saved $1580. Read the details.



John Felmley Co. did not permit retarded concrete curing in cold weather to slow up this job. They switched to Lehigh Early Strength Cement to get concrete which would quickly cure beyond the danger of damage by frost and rapidly develop service strength. Temperature averaged 20° F. when concrete was poured for the first two floors. In only three days forms were removed. This speed reduced construction time for the first two floors by eight days. There was a four-way cash saving:

1. Labor, $20 per day for 8 days—$160; 2. Curing, $15 per day for 8 days—$120; 3. Forms, $500 on each of two floors—$1000; 4. General Overhead, $300.

When the weather moderated the job was finished with normal cement. Quick Service Concrete added speed when it was vital. For any job, large or small, entirely or for key portions, use Lehigh Early Strength Cement. In 24 to 48 hours, under the same conditions, its strength compares with that of normal portland cement at seven days.

General informative literature or data on the advantages of Lehigh Early Strength Cement for any specific project will be sent promptly on request to the Lehigh Service Department.

LEHIGH PORTLAND CEMENT COMPANY, ALLENTOWN, PA., CHICAGO, ILL., SPOKANE, WASH.

The Only Trucks allowed in the Tunnel

Showing four of the Cummins Diesel-powered Autocars owned by F.G. Mather at the entrance of the river by-pass tunnel being dug through solid rock by B. Perini & Sons, Inc., on their 6-year Lackawack Dam job in upstate New York. Because of no carbon monoxide in Cummins Diesel exhaust, these are the only trucks allowed in the tunnel.

These Cummins Diesel-powered Autocars make a ¾-mile round trip in 11 minutes . . . half the time needed for the former gas-powered jobs. They go over the hills and rough footing in third gear direct when the gasoline-powered trucks needed low second. Carrying bigger loads of six to eight yards of stone and blasted rock, they burn less than a gallon of cheap fuel an hour.

This "Job-Test Evidence" of the power and unrivalled economy of Cummins Diesel Engines is not just an individual record . . . it is typical of the added profits you can put in your bid with Cummins Dependable Diesel power.

Cummins Engine Co., 1715 Wilson St., Columbus, Indiana.

CUMMINS
Dependable
DIESEL
PIONEER IN MODERN DIESEL DEVELOPMENT

STEP UP *with* MA

STURDY

Today, more than ever before, you need an excavator that is faster and more dependable. It is a fact that major contracts are being awarded to contractors who are basing their bids on what they know they can do with modern equipment. • • • Consider MARION excavators in this light. They are built to give you maximum yardage at low operating cost. They incorporate many new and modern features that simplify the biggest and toughest of earth moving jobs. They are the ultimate in dependable operation . . . proven performance. • Compare the new, modern MARION, point for point, with any machine of its size on the market. Contractors who have, choose Marion.

THE MARION STEAM SHOVEL CO.
MARION, OHIO, U. S. A.

CRANES • CLAMSHEL

Ferguson & Edmonson Co.,
Pittsburgh, Pa.

TWO MODERN MARIONS are owned and operated by the above company and are used extensively on general contracting.

The Arundel Corporation
Baltimore, Md.

This company has MODERNIZED with MARIONS. Three modern Marions are being used on major construction contracts.

Dolese & Shepard Company
Chicago, Illinois

The importance of Modernizing with Marions is reflected in the TWO Modern Marions now being used by the above company.

AR DAGE ON

• DRAGLINES • SHOVELS
ELLS • PULL SHOVELS

FAST

MODERNIZE WITH MARIONS

FROM 3/4 CU. YARDS UP

Write for bulletins describing the size of Marion in which you are particularly interested. If you are not receiving THE GROUND-HOG regularly, ask to be put on the mailing list. » » »

HOLDING THEIR OWN

ON THOUSANDS OF MILES OF STATE HIGHWAY

On this section of Colorado State Highway No. 40, west of Denver, has been laid a road mix type low-cost Asphalt surface, using TEXACO SC-3 Surfacing Material as binder.

TEXACO asphalt

State Highways form the backbone of our national highway system. On thousands of miles of these important roads, low-cost Asphalt surfaces render completely adequate service.

County Road Officials and Municipal Street Officials can profit by the experience of the State Highway Departments. Just as they are a match for the traffic of a large portion of each State Highway System, low-cost Asphalt surfaces fully measure up to the traffic needs of large sections of every system of County Highways and City Streets.

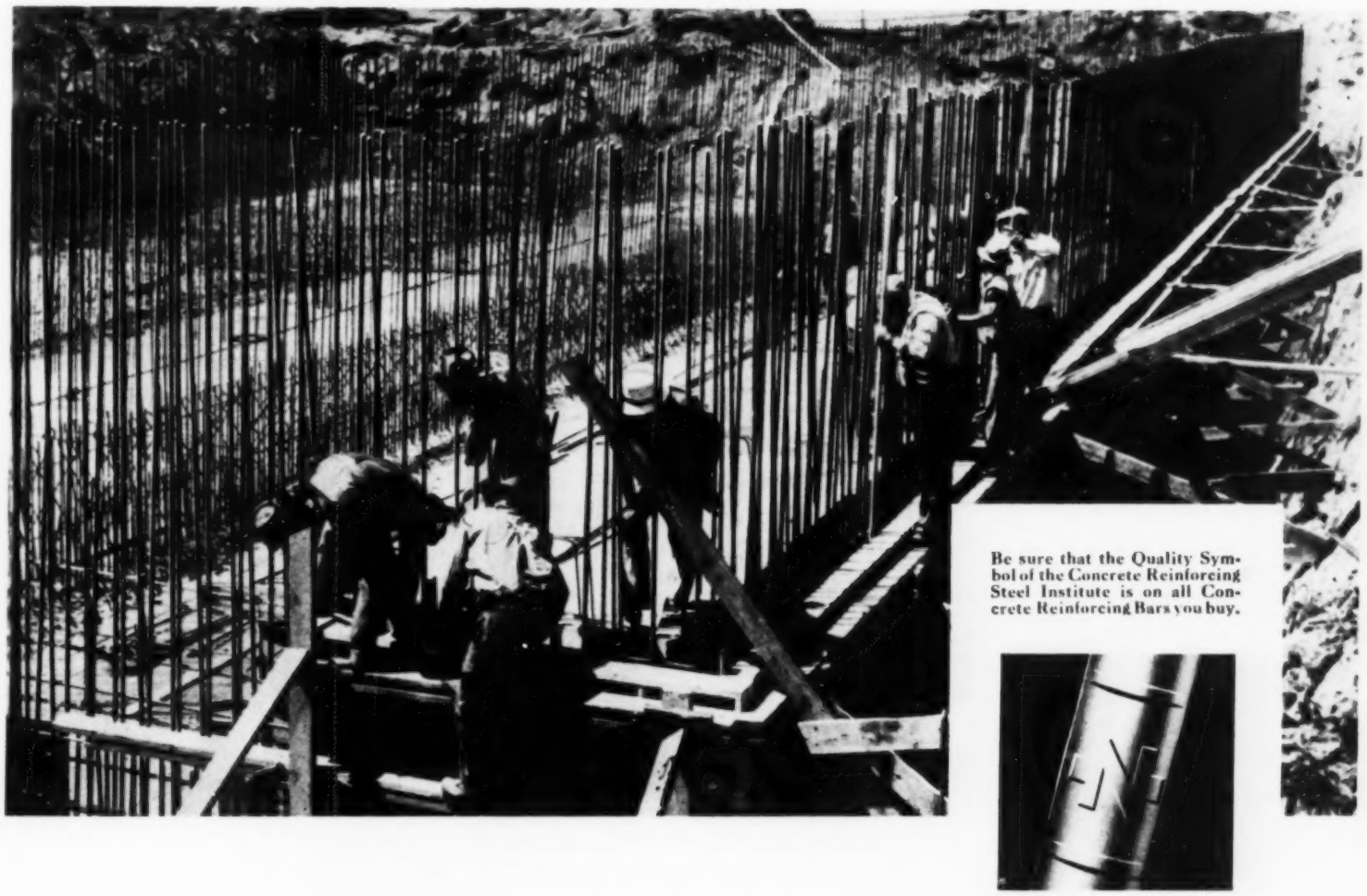
Locally available aggregate and the TEXACO Cutback Asphalt or TEXACO Emulsified Asphalt produced for that aggregate are plant-mixed or road-mixed to form tough, safe, all-weather surfaces.

For the interested road or street official's library, TEXACO offers a helpful, illustrated booklet, "Asphalt Roads — Intermediate Types." Write our nearest office today for a copy.

THE TEXAS COMPANY **Asphalt Sales Department** **135 E. 42nd St., New York City**

Chicago Cleveland Kansas City Philadelphia Houston Dallas Jacksonville Buffalo Richmond Boston

What has "ON TIME DELIVERY" *to do with Construction Profits?*



Be sure that the Quality Symbol of the Concrete Reinforcing Steel Institute is on all Concrete Reinforcing Bars you buy.

YOUR best opportunity for profit lies in finishing jobs on time or even before. This is especially true when there is a penalty clause in your contract. Finishing jobs on time makes it possible for you to complete more jobs per year . . . gives you maximum production from each labor hour and piece of equipment.

But you can't beat time if you have to wait for materials. That is why "on time delivery" by distributors of U·S·S Concrete Reinforcing Bars is so important to you. Our distributors are strategically located and carry ample stocks of standard shapes and sizes, so that no matter where your job may be you can always count on having U·S·S Concrete Reinforcing Bars on hand when you need them.

All U·S·S Concrete Reinforcing Bars carry the Quality Mark of the Concrete Reinforcing Steel Institute. This is your assurance that these bars meet the highest standards in the industry. For to carry this symbol of quality, concrete bars must be rolled from new billet steel of standard specifications and must be a product of domestic manufacture.

When you need concrete reinforcing bars, look to our distributors for a product of the highest quality and a service that will save you money. If your job requires special attention, we are equipped to cut and bend U·S·S Concrete Reinforcing Bars wherever facilities are inadequate.

U·S·S CONCRETE REINFORCING BARS

Manufactured by

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Speed-o-Matic

SHOVEL - DRAGLINE - CRANE

Yardage Counts

"My job is to keep the crew producing and that's why I'm a Speed-o-Matic booster. More yardage — trucks loaded faster — operators happy and going full speed throughout their shifts. Believe me, I'm through with old-fashioned mechanical hand-lever machines!"

Buys one Speed-o-Matic . . . orders two more!

Actual results on tough jobs proved to the owner of this shovel (name on request), that a Speed-o-Matic will do everything claimed for it and more. That's why their purchase of one Speed-o-Matic soon led to repeat orders for two more and the fact that this company had 20 shovels, draglines and clamshell cranes of various makes in operation placed them in a position to accurately judge Speed-o-Matic performance.

It will pay you to get complete information on Speed-o-Matic Shovel-Dragline-Crane. Write today!

Operator fatigue banished — machine action speeded up — wearing parts greatly reduced — that's Speed-o-Matic!

LINK-BELT COMPANY

300 West Pershing Road, Chicago
Distributors and Offices in Principal Cities

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LINK-BELT

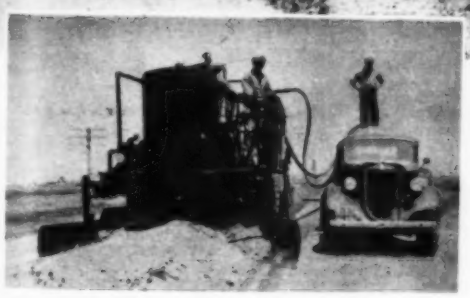
HERE'S REAL PRODUCTION ON STABILIZED ROADS--

MIXING 12-14 CU. FT. WINDROW FOR 36 FT. SAND-CLAY-GRAVEL BASE AT RATE OF 160-180 TONS AN HOUR WITH JAEGER ROAD BUILDER

Belt Attachment for Heavy Windrows Produces Even Windrow of Mixed Material Behind Traveling Pugmill—36 Ft. Road Base Kept Clear. Strom Construction Co., Fargo, N. D.

... Mixing 14 miles of windrow (approx. 55 tons per 100 ft.) at rate of 5'3" a minute — for 3" compacted base.

... Same job from rear, showing material evenly windrowed at roadside, ready for spreading.



APPLIES WATER OR BINDER WHILE MIXING

Water to insure optimum content for greatest compaction of sand-clay-gravel or binder material for bituminous mixes is pumped from supply truck moving alongside and accurately measured into pugmill as Road Builder advances.

Tractor Drawn Road Builders are available for light retread and stabilization work.

On today's big stabilization programs, more and more contractors are producing both base and top by one-pass mixing with the Jaeger Road Builder.

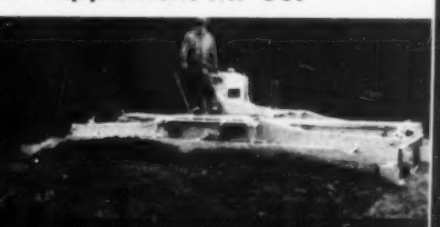
On full-width work, windrows up to 14 cu. ft. are being mixed and re-windrowed by the Jaeger Road Builder at the rate of 60 to 65 ft. per minute — one machine and one operator producing a more uniform and denser mix than can possibly be obtained by blades. On half-widths, Jaeger Leveling Device is being used to mix and finish in a single operation.

Many hundreds of miles of various types of stabilized base and bituminous retread — from Minnesota to Mexico and ranging from 1" retread in 10 ft. widths to 36 ft. sand-clay-gravel stabilized base laid in 3" compacted courses — have been completed by the Jaeger Mix-in-Place Pugmill method. Details of these jobs will gladly be furnished to contractors and engineers interested in bigger production, lower cost and longer-lasting roads. Ask for Supplement MP-38.

JAEGER BITUMINOUS PAVER for Precision Smooth Pavements at Low Cost

JAEGER Mix-in-Place ROAD BUILDER

THE JAEGER MACHINE COMPANY, 800 Dublin Ave., Columbus, Ohio



JAEGER AUTOMATIC FINISHER for Highest Type Concrete or Bituminous

GOING AFTER A BIG JOB IN A BIG WAY!

lozer-equipped "Caterpillar" Diesel D8 Tractor shows wh. can do in the way of fast clearing. This is at the Vallecito Dam, Durango, Colorado. Trees, stumps and brush are taken out and piled for burning—to make room for the borrow-pit. A good sturdy pusher, this outfit has just as much power at the rear as a hauling-unit!

Drying test-holes at the Vallecito Dam with a Gardner-Denver compressor powered by a "Caterpillar" Diesel D13000 Engine. Plenty of dependability, here . . . and plenty of economy, as the engine works away on a minimum of low-cost fuel!

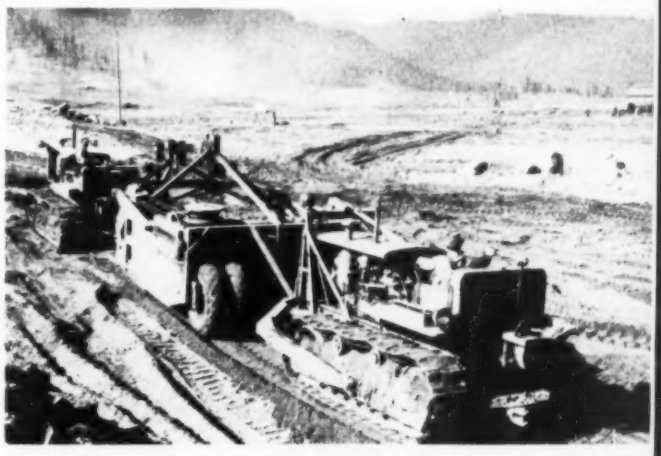
THESE PICTURES show you the opening guns on the Vallecito Dam, near Durango, Colorado. Also known as the Pine River Project for Flood Control and Irrigation, this will stack up—in size—with many another of the gigantic jobs of recent years. And, as on so many of those jobs, *the leading power here* is "Caterpillar" Diesel!

With tracks that conquer soft footing and grades . . . power that pushes or pulls the heaviest loads . . . stamina and strength that cut maintenance . . . and an economical use of economical fuel, *"Caterpillar" Diesels offer the surest way to move earth at a profit!*

No matter what work you have in hand or in prospect—whether it's large or small—go after it in a big way, with *big-paying* equipment. Your nearest "Caterpillar" dealer will gladly sit down and help you figure dollars and cents; *help you get out from under* the burden of high-cost yardage!

Two more "Caterpillar" Diesel units at the Vallecito m. In the foreground, you see a D8 Tractor pulling ripper before the scrapers come in. Notice the rock-rake dozer on the front. With this, and the power of a "Caterpillar" Diesel Tractor, big boulders are handled with ease. The tractor in the background, compacting a fill with a sheep's-foot tamper, is also a "Caterpillar" Diesel D8.

Speeding up the loading at Vallecito Dam! A "Caterpillar" Diesel D8 pulls a 12-yard carrying-t scraper while another "Caterpillar" Diesel gets behin and lends its strength to hurry the job . . . and save even more money!



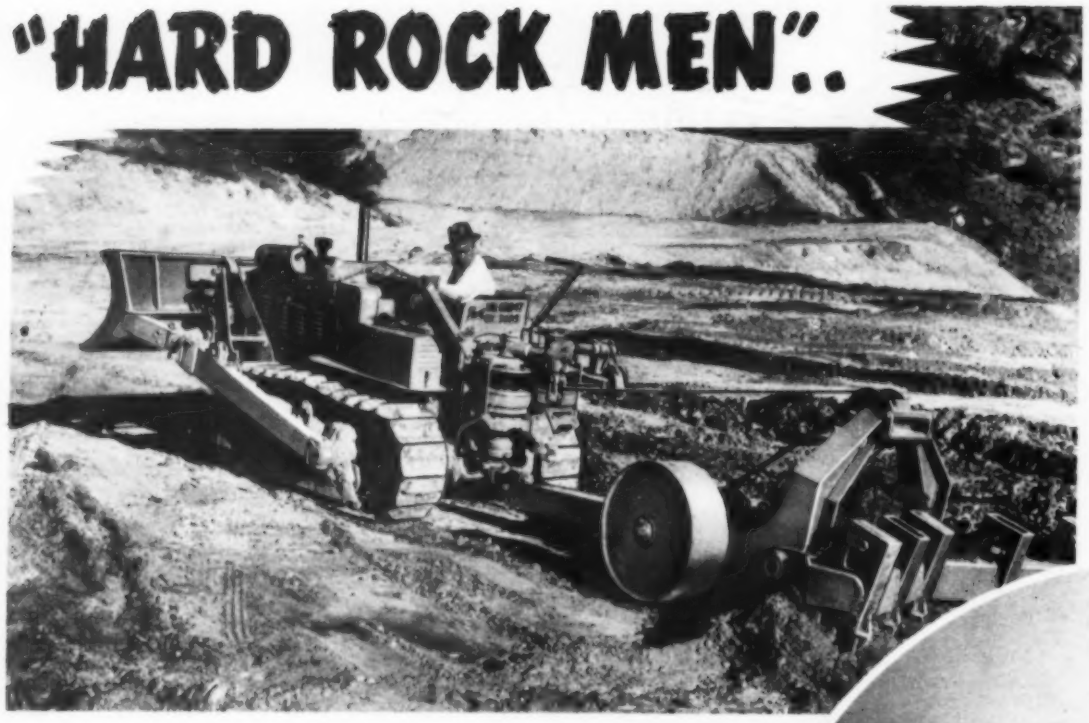
CATERPILLAR

REG. U.S. PAT. OFF.

TRACTOR CO., PEORIA, ILLINOIS

DIESEL ENGINES · TRACK-TYPE TRACTORS · ROAD MACHINERY

"HARD ROCK MEN"..



CUT AND FILL with this powerful Emsco Ripper. (Left) To overcome high stresses and shocks met in breaking hard-pan, shale and rocky soils, Emsco Derrick and Equipment Co., Los Angeles, uses SAE 3135 and 3140 heat-treated Nickel-chromium steels in axles and sheave shafts of this Emsco Ripper. The Cletrac tractor which powers it also makes use of Nickel alloy steels for vital parts.

THESE
NICKEL ALLOY STEELS

LUCKY is the engineer whose foremen are tough, tireless, "hard rock men". Lucky is the engineer whose machines and equipment are toughened and strengthened by Nickel alloy steels and Nickel alloy cast irons. Luck is partly in learning the right alloy for the right place. Why don't *you* learn how Nickel solves tough operating problems?

BACKS AND SHOVELS. Places on every job must be worked with back muscles and shovels. Good shovels utilize Nickel alloy steels for longer wear against abrasive materials, for springiness and toughness to resist breaking—and for welcome lightness with strength which permits better balance and easier shoveling.

61 TONS PER TRIP! This Mack truck with LeTourneau body (above) hauls 61 tons of muck at Bonneville Dam, makes 25 m.p.h. on return trips. To assure strength with minimum deadweight in earth moving equipment, nothing surpasses the demonstrated sturdiness and wear resistance of Nickel alloy steels.

TOUGH shovels made from Nickel-molybdenum steel by the Ingersoll Steel & Disc division of Borg-Warner Corp., New Castle, Ind., must pass this bending test, pictured above, and spring back to their original shape. "Tem-Cross" rolling and heat treatment give a tensile strength of 240,000 pounds per sq. in.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

World Famous LAPLANT-CHOATE Equipment Puts *Extra Profits* in Earth-Moving Jobs

Hydraulically controlled LaPlant-Choate Bulldozer gives you positive down pressure for digging and rigid blade locking in **any** position for pushing.

YOU APPROACH every job with new confidence in your ability to do better work . . . *profitably* . . . when you have time-saving, money-saving LaPlant-Choate equipment. A pioneer in the field, LaPlant-Choate scientifically engineers every unit in its internationally famous line to give you maximum output with operating and maintenance costs so *low* that you make extra profits easily.

When the job calls for pushing, hauling, digging, scraping, tamping . . . there's a LaPlant-Choate unit to do more work for you at lower cost per yard moved! In good weather or bad; on level ground . . . in hills or mountains . . . on hard packed or spongy soil, LaPlant-Choate equipment is easy to operate, safe, dependable and singularly free from expensive delays and breakdowns.

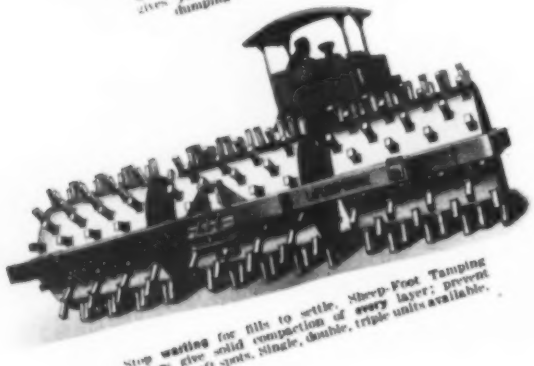
Thousands of alert contractors and users in all parts of the world recommend LaPlant-Choate equipment to you. LaPlant-Choate means Lower Cost. Get full details today from your LaPlant-Choate and "Caterpillar" dealer. Write for free literature on the complete line.

Complete, positive, finger-tip **hydraulic control** makes this LaPlant-Choate Trailbuilder essential profit-producing equipment on earth-moving jobs.

All LaPlant-Choate equipment is designed exclusively for use on "Caterpillar" Track-type tractors. This assures you of a perfectly balanced, properly coordinated unit with **all** unnatural stresses and strains eliminated . . . an important feature that cuts upkeep cost and adds to the many years of profitable service these units give you. Competent, readily available service facilities are always obtainable from your nearest "Caterpillar" dealer.

No inside obstruction to cause dumping resistance; **hydraulic control** for operating the doors and lowering makes LaPlant-Choate Rubber Wheeled Wagons real cost cutters.

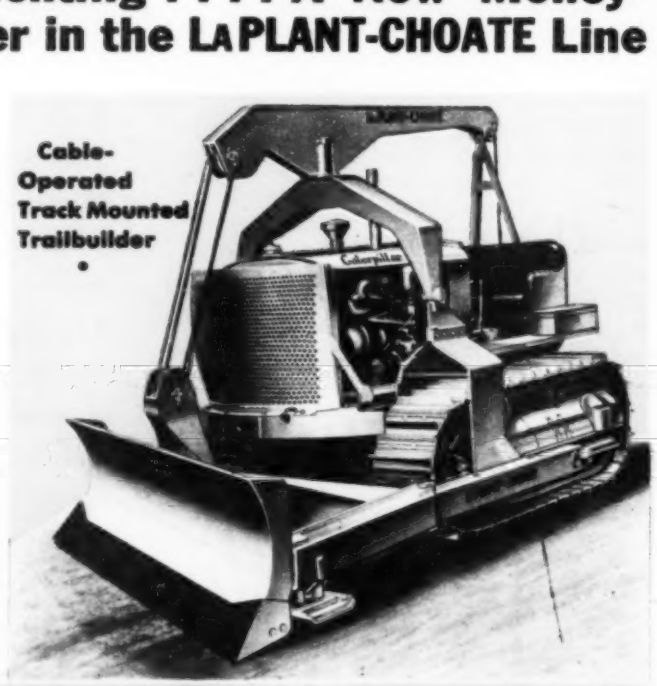
The **hydraulically controlled** "Carrimor" rear dumping scraper reduces loading resistance scientifically and gives you larger loads with less power and permits dumping over end fills or spreading in layers.



Stop **waiting** for fills to settle. Sheep-Foot Tamping Rollers give solid compaction of **every** layer; prevent voids and soft spots. Single, double, triple units available.

Presenting . . . . A New Money-Saver in the LAPLANT-CHOATE Line

Cable-Operated Track Mounted Trailbuilder



For those whose job permits the use of a cable-operated type of Trailbuilder or Bulldozer, LaPlant-Choate introduces its new track-mounted unit. Our years of engineering experience have been utilized to the fullest to give you maximum efficiency and famous LaPlant-Choate quality in these new additions to our line.

Equipped with "Caterpillar" cable-controlled units and designed exclusively for use on "Caterpillar" Track-type tractors. Ask your LaPlant-Choate and "Caterpillar" dealer for complete details.

TRAILBUILDERS
SNOW PLOWS
TAMPING ROLLERS
TREEDOZERS

LA PLANT-CHOATE MANUFACTURING CO. Inc.

BULLDOZERS
BRUSH CUTTERS
RUBBER WHEEL WAGONS
CARRIMOR SCRAPERS

CEDAR RAPIDS, IOWA.

Join the Charmed Circle of Contractors who have

PUSHED THEIR SCRAPERS TO THE LOWEST COST PER YARD

IN SANDY MATERIAL this 20-Yard Carryall was pusher loaded to earn extra profits for Louis Davis Construction Corp., Seaford, N. Y. 180,000 yards were excavated on this job to build a drainage basin for a North Bellmore (L. I.) parkway.

You've heard a lot about *pusher* loaded scrapers . . . we've talked it . . . others have talked it. Maybe you're one who helped pioneer the idea . . . 4 years ago . . . to get your 15% extra yardage each load in common earth . . . to cut loading time 33⅓% to 50%. If so, you have joined the "charmed circle" of contractors who today have an edge in the bidding . . . in the profits!

These contractors have gone still farther . . . by using *full drawbar horsepower* of both pusher and hauling tractor. Let's look at it this way: a tractor of 95 hp. will load to overflowing a 12-yard scraper. Add another tractor of equal rating (and you may as well, for fixed cost is about equal to smaller ones) and you have power going to waste.

It remained for R. G. LeTOURNEAU to solve this: by building an extra capacity scraper that matched perfectly one tractor's towing ability — and two tractors' horsepower for loading.

Make this comparison. A 12-yard scraper will get 9.8 pay yards pusher loaded with clay . . . a 20-yard LeTourneau Carryall will get 16.8 pay yards under the same conditions . . . with the same horsepower! On a one way haul of 800 feet, the 12-yard will average 59 pay yards per 50 min. hour . . . while the 20-yard Carryall will deliver and place 84 pay yards per 50 min. hour . . . at *18% lower net cost per yard*, including all ownership and operating expense.

Three major LeTourneau Carryall features make this amazing difference possible: (1) Hard-faced self-sharpening blades are set at plow-like angle to penetrate *naturally*, thus, cut power demand, (2) light weight with brute strength produced by patented box-beam, special alloy steel construction — "floated" on plenty of broad tread, large diameter tires, (3) plus a positive ejection tailgate that "wipes" each load clean. Thus, the next load slides and boils in without resistance, regardless of material, wet or dry.

Some day you'll try Le Tourneau earth moving tools. It is the only *complete* line on the market — backed by more than 3,000 successful Carryall® Scrapers from 3 to 30 yards, 'Dozers, Rooters, Cranes, Buggies and Power Control Units. Ask your "Caterpillar" and LeTourneau dealer for a demonstration! It will pay.

PACKED CLAY heaped over the "spring pipe" each load for Contractors Heafey Moore Company and Frederickson & Watson Construction Co., of Oakland, Calif., on the 2,183,000-yd. highway excavation for the Santa Cruz Cutoff. 9 such 20-yard Carryalls are being used to complete 6.3 miles of cut and fill.

STUBBORN DIGGING faced Bedenhamer Construction Co. on a 3½ mile highway job between San Jose and Gilroy, Calif. A Diesel "75" acted as pusher, and between trips ripped the hardpan with the LeTourneau Rooter, used in combination with the pusher-'Dozer.

LETOURNEAU

CARRYALL SCRAPERS

Manufacturers of: Angledozers,® Buggies,® Bulldozers, Carryall® Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters,® Treadozers, Sheep's Foot Rollers.

® Name registered U. S. Patent Office.

"WE *Watch* COMPARATIVE MAINTENANCE COSTS...

...*and use* GULF'S *higher quality* LUBRICANTS to keep them down" SAY LEADING CONTRACTORS

"We DISTINGUISH CAREFULLY between LUBRICANTS costs and *LUBRICATION* costs," says this contractor. "We bring comparative maintenance costs into the picture when we figure our *final* lubrication costs. If maintenance is low while operations hold steady — or increase — we know our *real* lubrication costs are low, even though we've paid a few cents more per gallon for quality lubricants."

That far-sighted viewpoint is helping hundreds of contractors, from Maine to Texas, secure the economies needed today for profitable operation. And it logically leads them to the use of Gulf's higher quality oils and greases. Contractors find that when these better grades of lubricants are applied as recommended by an experienced Gulf engineer, the work flows more smoothly, less time is lost for adjustments and repairs, and maintenance costs are lower. After Gulf quality lubricants have been placed in service, it is not uncommon for contractors to report savings in maintenances alone amounting to more than the total monthly bill for lubricants!

So we suggest that you *watch comparative maintenance costs* from month to month, and ask a Gulf engineer to assist you in finding ways to effect savings through improved lubrication. He will work tactfully with your operating men — and they can benefit from his broad experience in the lubrication of equipment similar to yours. Gulf Oil Corporation — Gulf Refining Company, Gulf Building, Pittsburgh, Penna.

GULF INDUSTRIAL LUBRICATION

DIPPER STICKS *that can* "TAKE IT"

sticks of unusually heavy section rigidly connected to each other, both top and bottom, giving them approximately 50% greater resistance to twisting strains than if the inner ends were free and not tied together.

GASOLINE • ELECTRIC • DIESEL • OIL

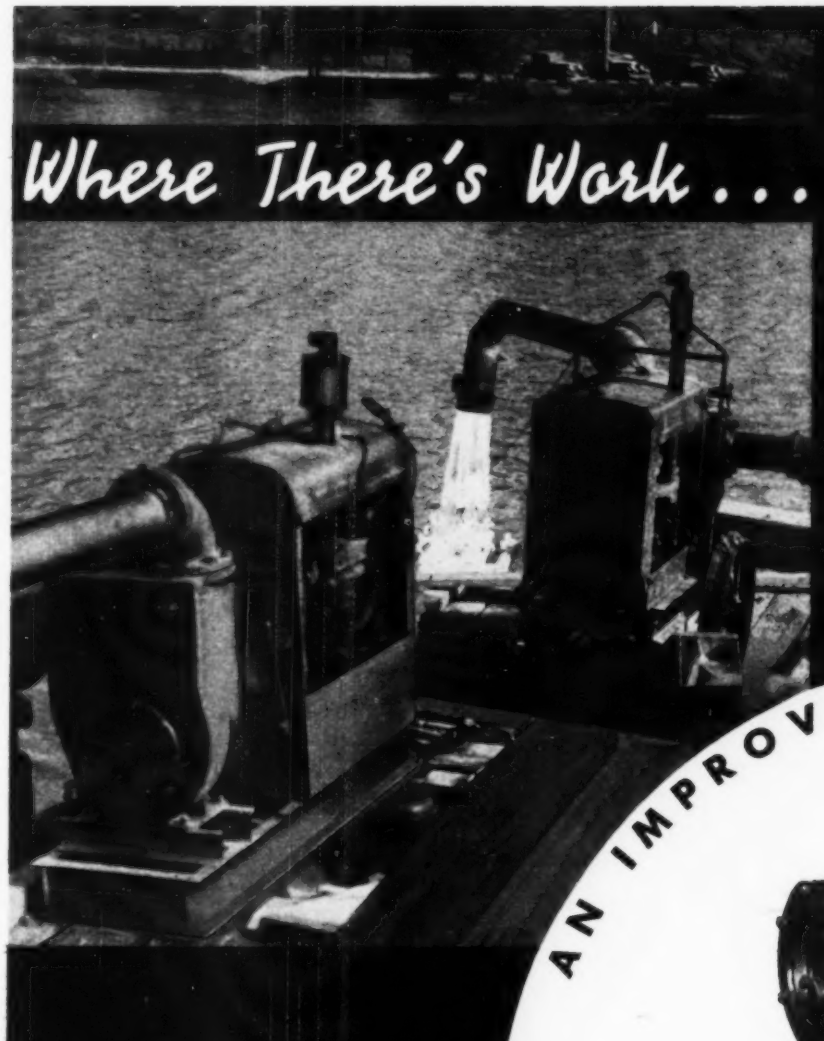
Built in a range of 18 SIZES ⅜ yd. capacity and Larger

NORTHWEST ENGINEERING COMPANY
1728 Steger Bldg., 28 East Jackson Blvd.
Chicago, Illinois

NORTHWEST

Shovels • Cranes • Draglines • Pullshovels • Skimmers

—and if you have a real Rock Shovel you won't have to worry about output in dirt



Where There's Work...

NOVO'S on the JOB!

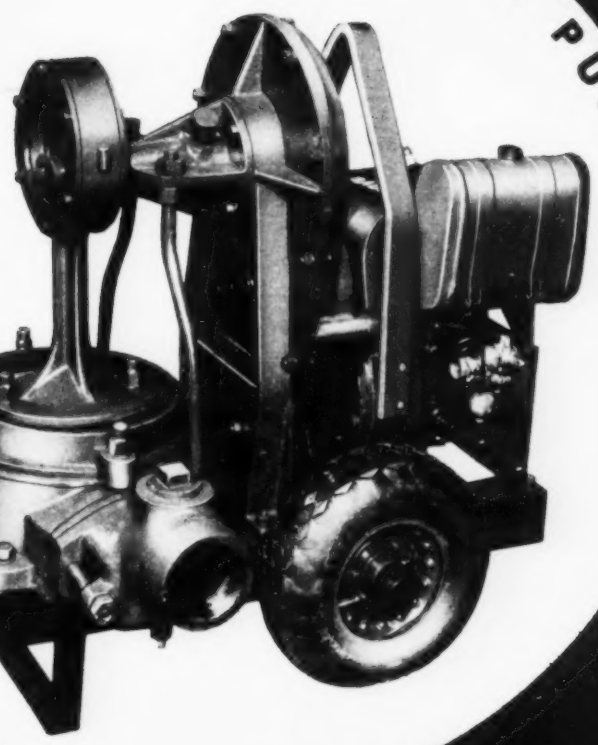
Have you noticed the number of jobs that are now going, on which Novo equipment is in evidence?

There must be some relation between the outfits who are getting the work and Novo equipment.

Jobs are tough to get — Novos are the answer to tough jobs. There's the tie-up.

(Left) Here are two 6" Novo Self-Primers on a bridge job now under construction. These two pumps, delivering their full capacity of 90,000 GPH — took down the 18' of water from inside of the sheet piling, and although a tremendous amount of seepage complicated this job, the pouring of concrete footings was accomplished on time.

AN IMPROVED DIAPHRAGM PUMP



(Below) "What a pump!" says Mr. Craft, operator of this Novo Pressure Pump, furnishing water for the boiler on a steam shovel taking gravel out of a creek near Jackson, Kentucky. Owners — the Highland Construction Co. of Louisville, Ky. "The operating cost is practically nil, and it performs in a highly satisfactory manner at all times." This is a Model AU, the smallest of the long line of Novo Pressure Pumps.

Here is your old friend with a new waistline. A new Novo Diaphragm Pump that is: Light Weight — Modern in Design, completely enclosed gearing, built-in power unit and Priced much lower.

Send The Coupon

NOVO ENGINE CO.

214 Porter St. Lansing, Mich.

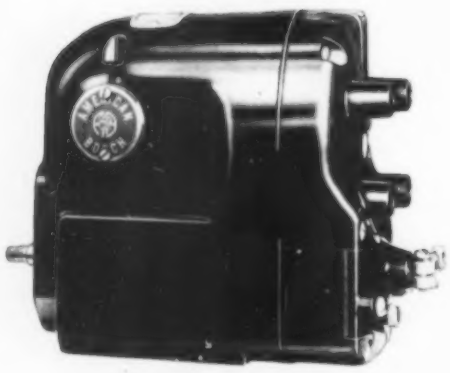
Send me complete information on that

New Diaphragm Pump.... ☐ And Novo Pressure Pump ☐
Also, Self-Priming Centrifugal Pumps ..... ☐ Or Hoists ..... ☐
Pavement Breaker ..... ☐
Light Plants ..... ☐

Name .....

Address .....

HELPS AMERICA'S "50 FOREMOST"
SLEEP BETTER, NIGHTS



THEY never worry about ignition complaints. They go to bed at night serenely confident. For the users of their equipment are protected by the most dependable ignition ever developed for gasoline engines.

"They" are more than 50 of America's foremost manufacturers, who equip the machinery they build with American Bosch Super Powered Magnetos. American Bosch combines the oldest tradition in magneto engineering with the latest and greatest advances in magneto history!

AMERICAN BOSCH CORPORATION, Springfield, Mass.

AMERICAN BOSCH
Super Powered MAGNETO

Construction
Methods and Equipment

Established in 1919
A McGRAW-HILL PUBLICATION

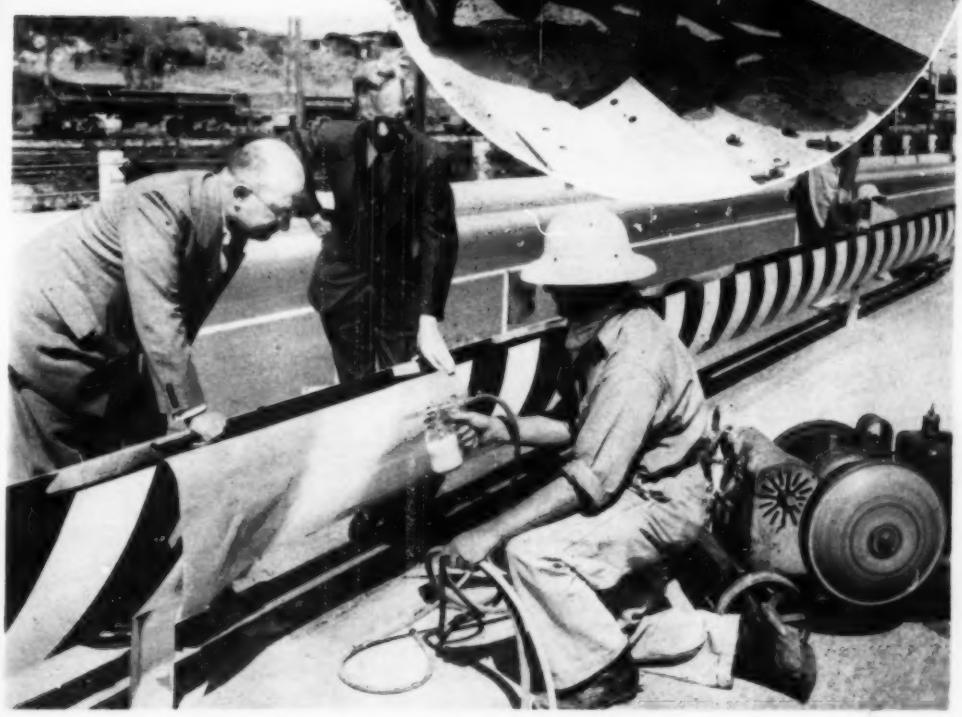
ROBERT K. TOMLIN, Editor

Volume 21 | **January, 1939** | Number 1

All-Steel DIVIDER *Prevents Highway Traffic Accidents*

CONVEX STEEL GUARD RAILS are bolted back to back 5 in. apart at hub-cap level to brackets on steel posts anchored in concrete.

RESILIENT SPRING - STEEL BRACKETS. (right) to which horizontal guard rails are attached, are bolted to steel posts just above ground level.



DIAGONAL STRIPING of black and white paint is applied to increase visibility of guard rail.

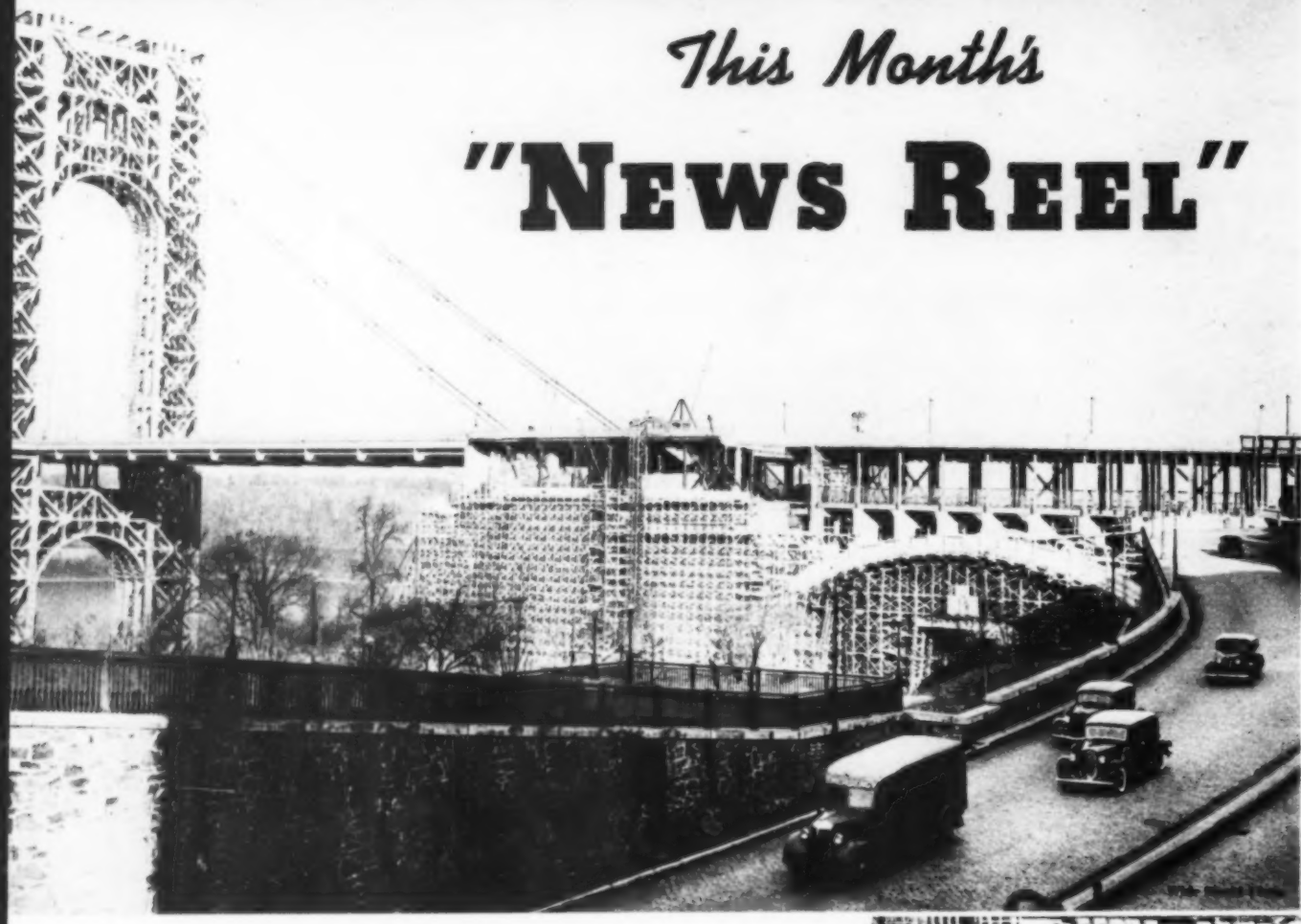
TO PREVENT head-on collisions and side-swiping accidents by motor vehicles traveling at speeds of from 45 to 50 mi. per hour on Ramona Boulevard, a four-lane main route with no cross traffic, the City of Los Angeles, Calif., has installed a 3,000-ft. length of all-steel road divider forming a continuous barrier between lines of traffic moving in opposite directions. In selecting the type of divider it was essential to use one that would occupy a minimum of highway width, as the pavement was not wide enough to accommodate a center safety island.

On the recommendation of Clarence Schultz, city engineer and R. T. Dorsey, traffic engineer, an all-steel divider made by the U. S. Spring & Bumper Co., of Los Angeles, was installed. It consists of a pair of convex steel guard rails each 12 in. wide attached, back to back, to heat-treated spring-steel brackets on posts 4 in. wide and only ¾ in. thick. The posts are spaced 12 ft. apart on straight sections of the road and 10 ft. on curves. The resilient steel guard rail strips are set at motor car hub-cap level, insuring maximum deflective and shock-absorbing action with minimum danger to vehicles and the occupants thereof.

With pneumatic hammers, holes 12 in. square and 24 in. deep were cut in the pavement to receive the steel posts which were anchored in concrete. The spring brackets were bolted to the posts just above ground level, allowing for quick and economical replacements or repairs of sections damaged by impact. The completed guard rail was painted with alternate black and white stripes.

This Month's

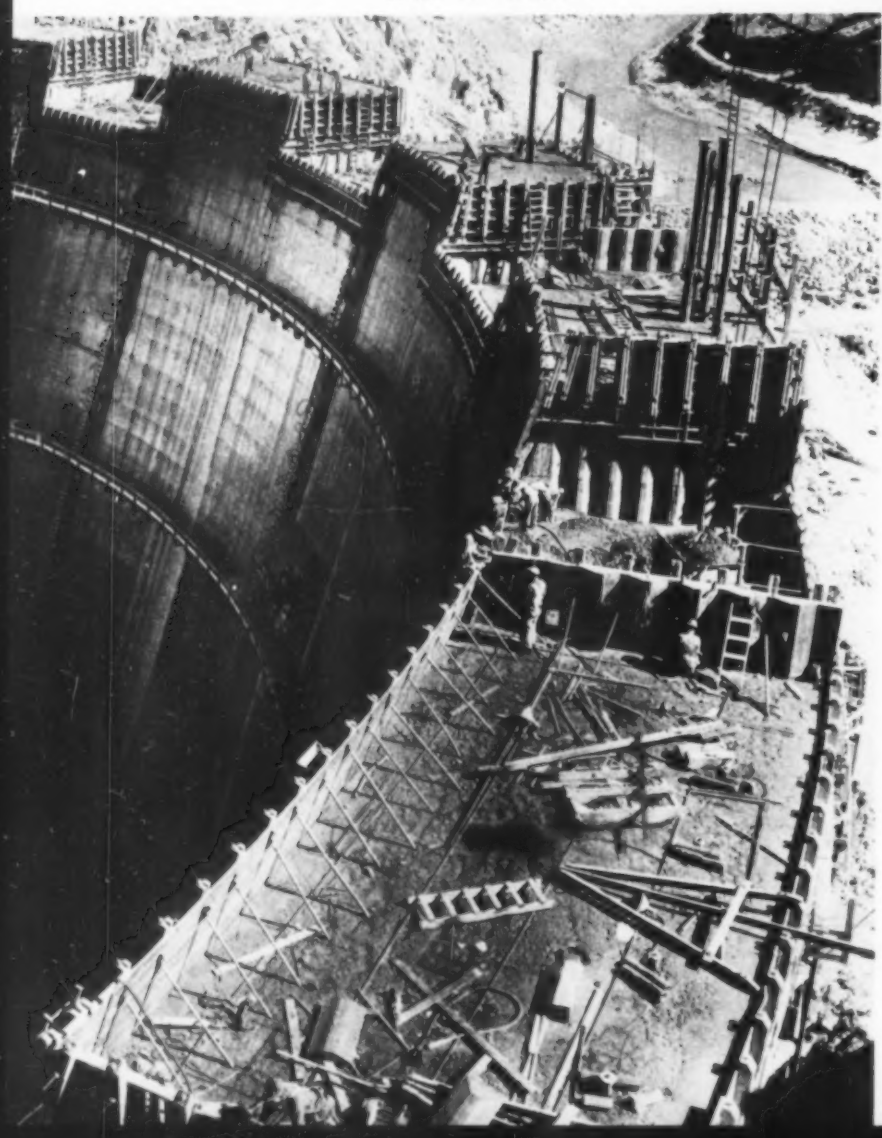
"NEWS REEL"



NEW APPROACH to George Washington bridge spanning Hudson River nears completion on New York side by Walter Kidde Constructors, Inc. Scaffolding erected for construction of new south roadway covers section of bridge crossing Riverside Drive.

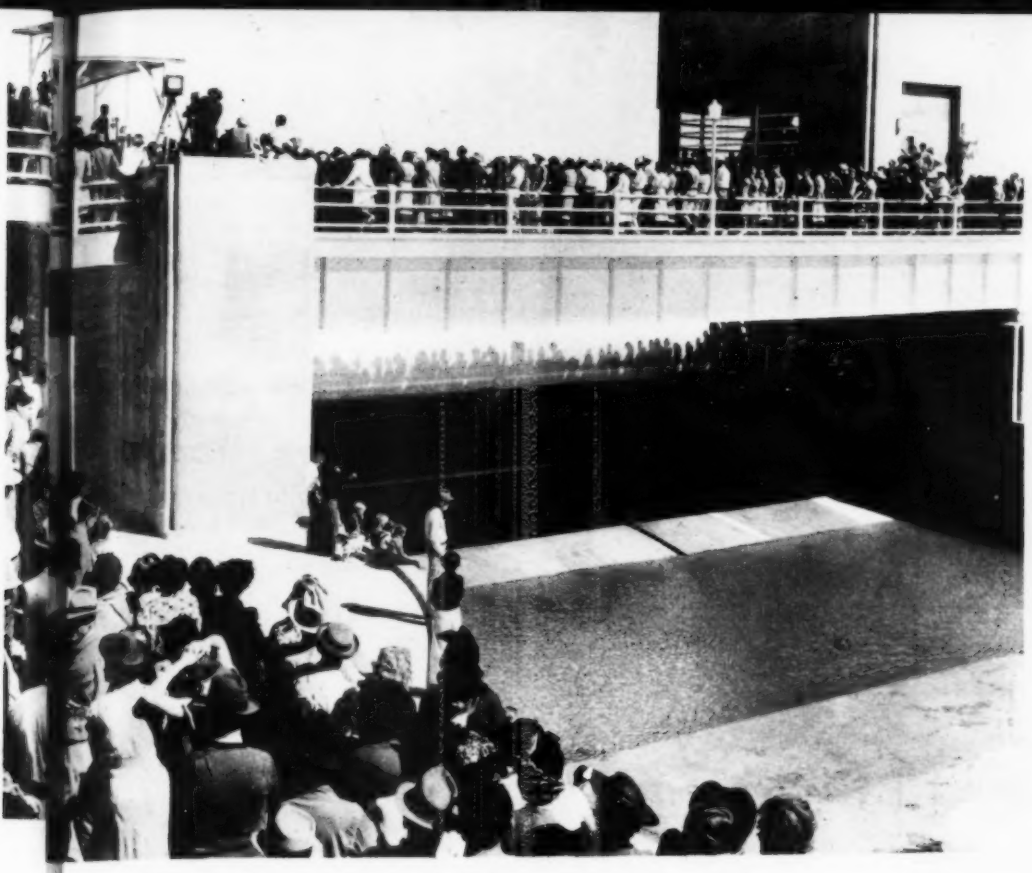
DEDICATION CEREMONIES (right) are held to mark completion of Imperial dam which will divert water from Colorado River through desilting works and into California's All-American canal. Contractor for $4,374,240 project is Morrison - Knudsen - Utah-Winston Co. Crest of structure 31 ft. high is equipped with four rolling gates, each 73 ft. long and 23 ft. in diameter.

CONSTRUCTION NEARS CREST (below) of Seminoe dam on North Platte River in Wyoming. On Dec. 1 the 257-ft. Bureau of Reclamation structure being built by Morrison-Knudsen-Utah-Winston Co., was 92 per cent complete

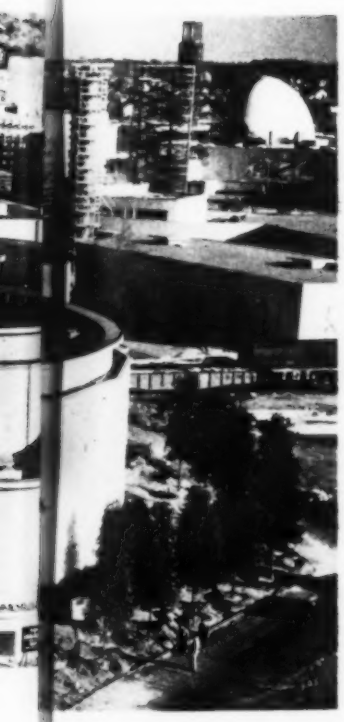


FIRST PRIVATE EXHIBIT BUILDING completed at New York World's Fair, 1939, is Johns-Manville structure in foreground. Designed by Shreve, Lamb & Harmon and erected by A. L. Hartridge Co., Inc., New York City, building appropriately incorporates numerous J-M structural and insulating materials, such as Transite corrugated sheets on nearest wing.

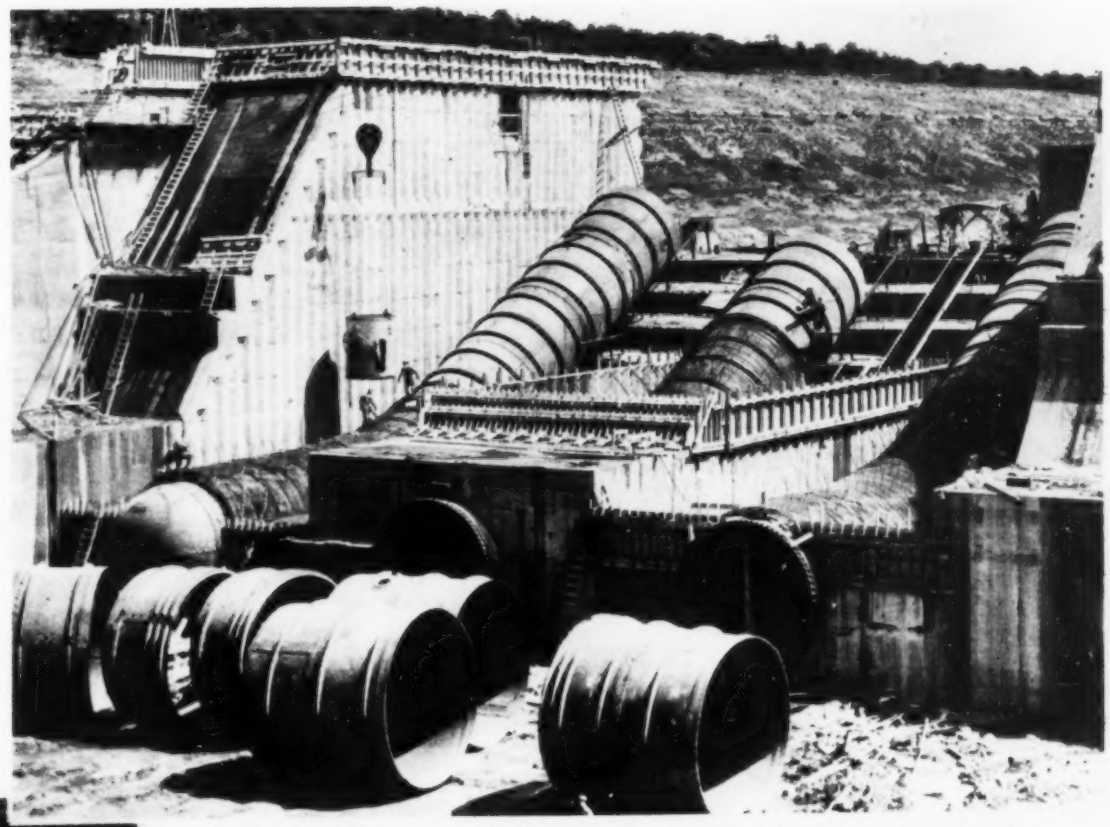
CONTRACTOR'S CAMP (right) takes form at Shasta dam, main feature of U. S. Bureau of Reclamation's Central Valley project in California. H-shaped dormitory will house 172 workers and large messhall accommodate 312 diners at a sitting. In addition to another dormitory there will be 131 family residences, office building, hospital, warehouse and shops to serve the personnel of Pacific Constructors, Inc., a 12-company syndicate that submitted low bid of $35,939,450 for huge concrete structure across Sacramento River.



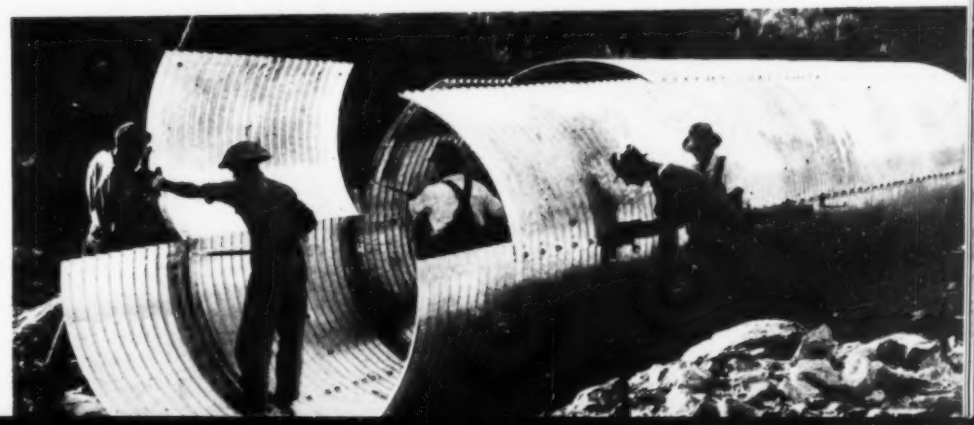
MILE-LONG CONVEYOR BELT, world's longest, is tuned up at Grand Coulee dam for moving sand and gravel for concrete mix. Installation requires 2 mi. of belting 4 ft. wide and weighing 80 tons which was shipped from factory in eight sections and vulcanized on job into endless band. Has capacity of handling 30,000 tons daily.



PENSTOCK PIPES (right) 16 ft. in diameter are installed at power house section of Marshall Ford dam, 190-ft. Bureau of Reclamation flood control and conservation structure being built on Lower Colorado River of Texas at cost of $5,781,235. Contractors are Brown & Root, Inc., of Austin, and McKenzie Construction Co., of San Antonio.



PIPE CULVERT (below) to drain embankment of relocated railroad at Deer Creek dam, Utah, is of Armco multi-plate construction. Dam is main feature of U. S. Bureau of Reclamation's Provo River project.

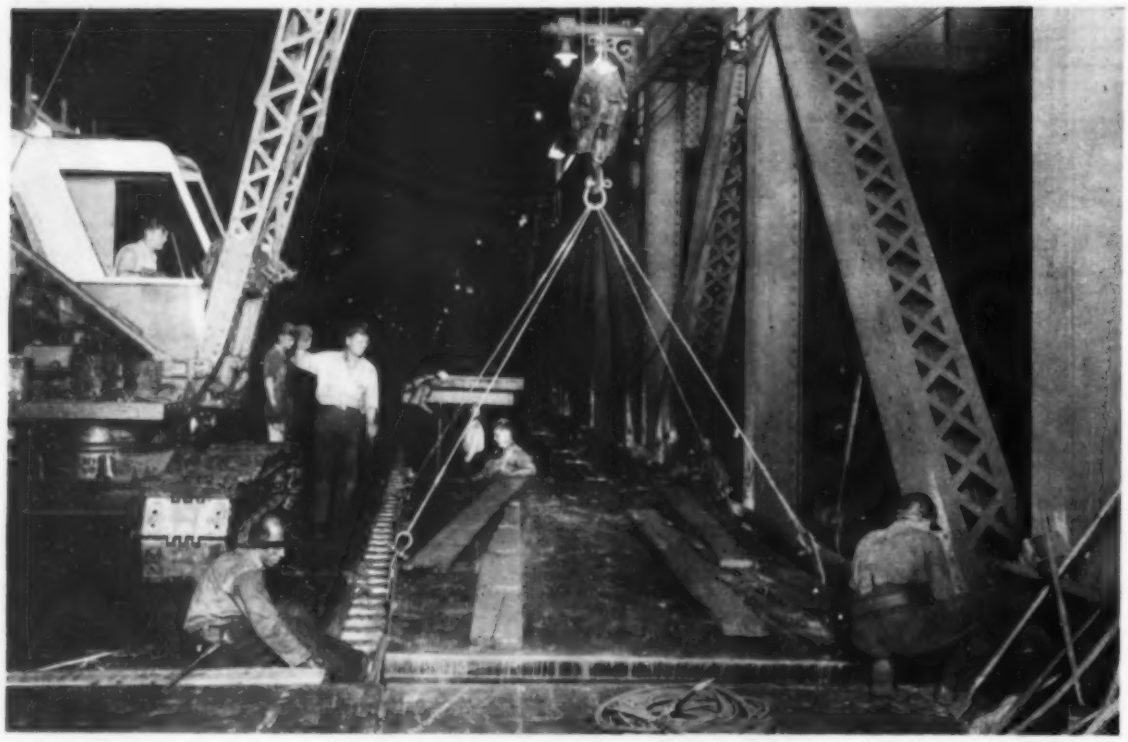


PRECAST CONCRETE SLABS

Replace Old Roadway of New York's Manhattan Bridge While Heavy Traffic Is Maintained

CAPT. L. P. BROWN (right), engineer in charge of Manhattan and Brooklyn bridges, confers with SAMUEL HAMBURGER, engineer in charge of bridge construction for New York City's Department of Public Works.

OLD SECTION OF ROADWAY, cut free from bridge by oxyacetylene torches, is raised by crawler crane and loaded on to waiting motor truck trailer for removal.



PRECAST SLAB is lowered to place by crawler crane to fill gap created by removal of section of old bridge floor.

PRECAST SLABS of concrete heavily reinforced with built-up steel grids, instead of concrete poured in place, simplified the job of replacing the old, worn-out wood block pavement which has carried vehicular traffic to and from Brooklyn on the Manhattan bridge across the East River, New York City, since that noted cable suspension structure, located a short distance north of the Brooklyn bridge, was placed in service Dec. 31, 1909. The use of precast concrete slabs on the Manhattan bridge roadway replacement offers a marked contrast to the monolithic pouring method employed in 1936 on the Queensboro bridge, another of New York City's four structures spanning the East River.

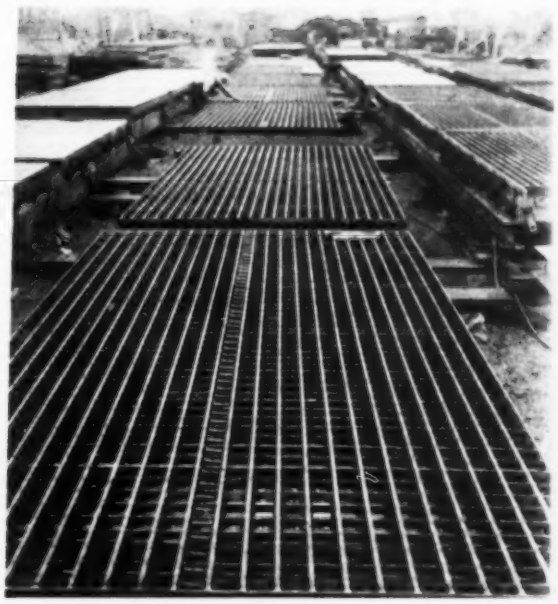
As described in CONSTRUCTION *Methods and Equipment* August, 1936, pp. 28-32, and March, 1937, p. 50, concrete for the Queensboro bridge roadway was poured in lanes by short, inclined chutes from truck mixers. The Queensboro roadway replacement was done by WPA labor mainly during the day time, and caused a partial blocking of the heavy flow of traffic which that bridge carries. This interference with traffic on the Queensboro bridge involved two roadway lanes, the one in which concrete was being poured and the other on which the truck mixer stood to deliver its batch to the forms. On the Manhattan bridge, however, the use of precast slabs, delivered as completely fabricated floor units, made it possible to carry on the major portion of the roadway replacement operations at night, with a minimum of traffic interference.

Briefly, the operations on the Manhattan bridge floor involved removing rivets and inserting temporary bolts in the old floor system during the

daytime, then at night, when traffic volume had dropped, cutting out sections of the existing floor system, removing them with a crawler-mounted crane and immediately dropping into the gaps thus created precast units of the new flooring, over which traffic could pass the next morning.

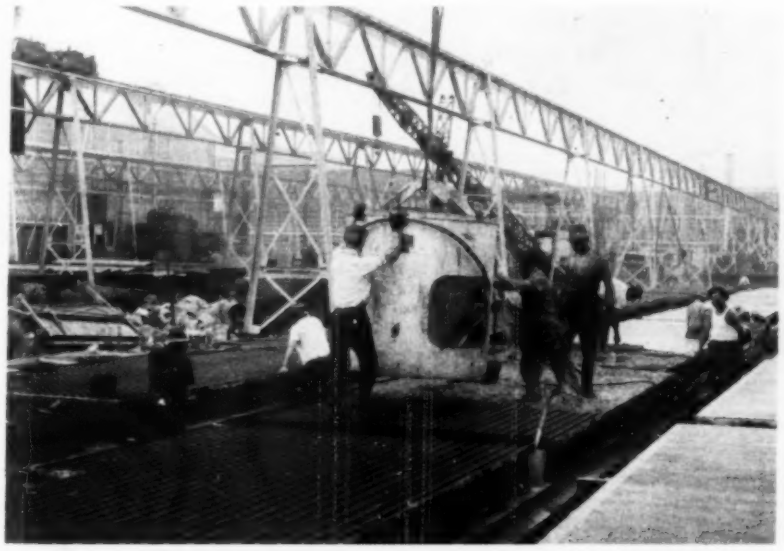
For replacing the Manhattan bridge roadway the city's Department of Public Works, departing from the day-labor methods employed on the Queensboro bridge, awarded to the Harris Structural Steel Co., of New York, a contract amounting to $736,930, and assigned to Capt. L. P. Brown, engineer in charge of the Brooklyn and Manhattan bridges, immediate supervision of the roadway replacement operations. A structure of the cable suspension type, costing approximately $14,100,000, the Manhattan bridge, in service since 1910, has a main span of 1,470 ft., side spans of 725 ft. each, together with about 2,000 ft. of approaches on each

TRUCK-MIXER delivers concrete into 1½-yd. bottom-dump bucket which is picked up by overhead traveling crane and dumped into forms for roadway slabs.



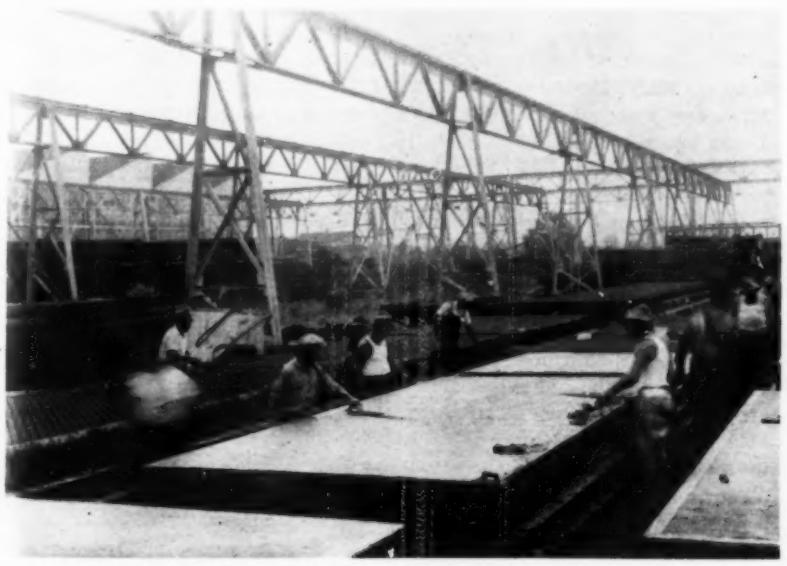
REINFORCING GRIDS for roadway slabs, containing I-Beam-Lok units welded into frames, are fabricated in nearby shop and transferred to concreting runways.

Keystone Cement Photos

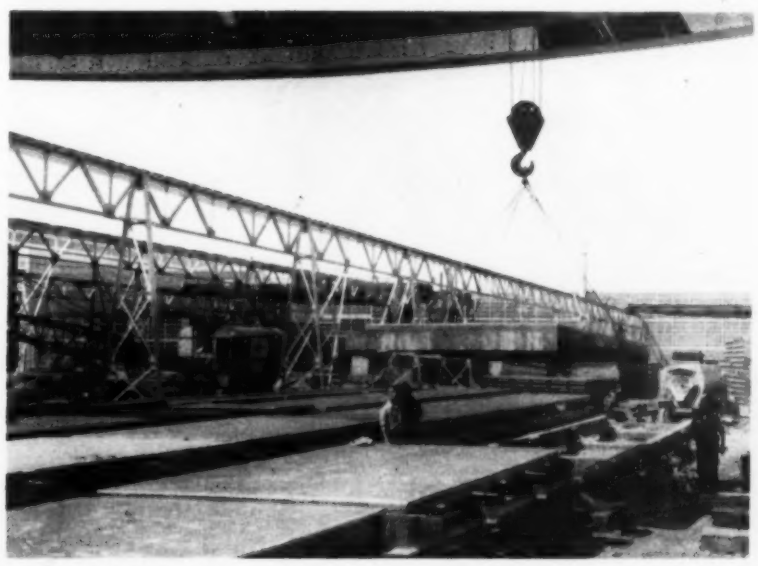


BUCKET is run out over forms by overhead crane and deposits its 1½-cu.yd. load of concrete on steel grid reinforcement of slab.

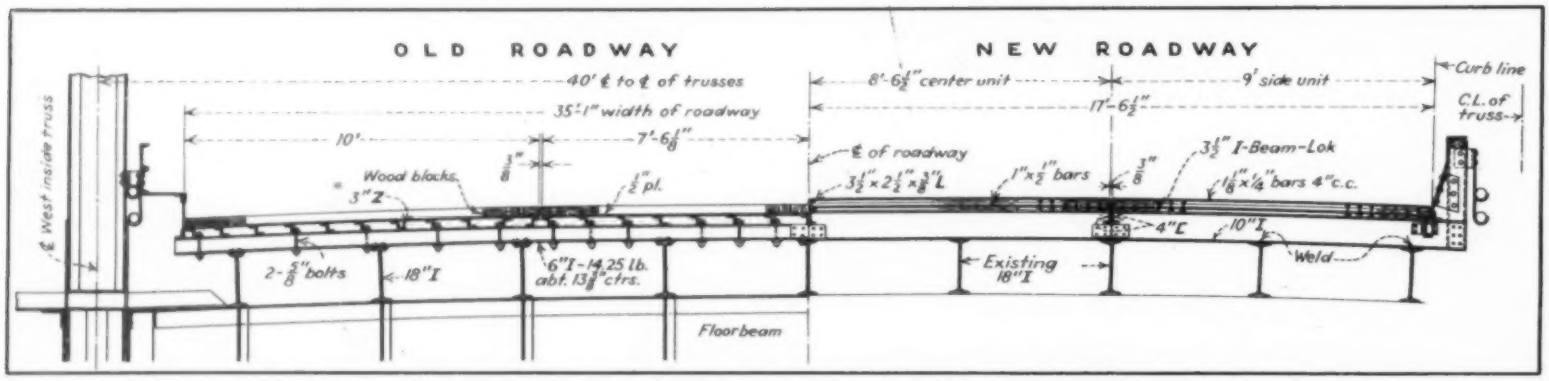
VIBRATING SCREED finishes surface of concrete slab containing reinforcing grids.



FINAL TOUCHES are given to vibrated slabs by hand troweling. Note overhead tracks for crane runway extending entire length of casting yard.



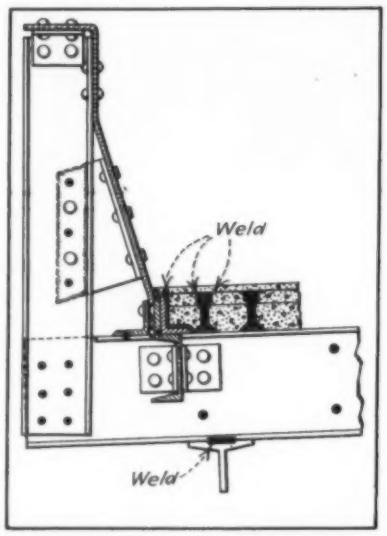
FINISHED SLAB, cured with bituminous spray, is picked up by crane 24 hr. after casting. Early slab removal is made possible by use of high-early-strength cement.

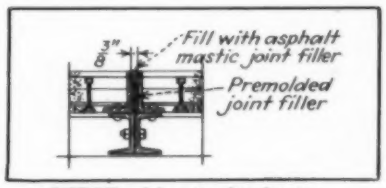


CROSS SECTIONS of old and new roadways for Manhattan bridge show how precast concrete slabs, reinforced with steel grids, replace wood block pavement on steel plates.

of the Manhattan and Brooklyn ends. The bridge roadway replaced under the present contract is 35 ft. 1 in. wide and 5,372 ft. long, involving a total of 188,450 sq.ft. of new paving in the form of 1,176 precast concrete slab units. Depending upon their location in the bridge spans and approaches, the dimensions of the precast concrete roadway units vary within small limits, but are, on the average, about 18½ ft. long and from 8 to 9 ft. wide. Each slab weighs about 3½ tons without structural steel supporting members, and about 6½ tons completely assembled for placement in the bridges.

The original roadway of the Manhattan bridge consisted of 3-in. creosoted wood block paving supported on ½-in. thick steel plates which, in turn, were carried on 3-in. Z-bars bolted to 6-in. I-beams resting on 18-in. I-beam stringers. The portion of the floor system being replaced includes everything above the existing 18-in. I-beam stringers. Using the 18-in. stringers for support the new roadway, delivered to the job in complete pre-fabricated units, consists of 10-in. I-beams, spaced 3 ft. 4 in. on centers, 4-in. thick slabs of concrete reinforced by 3½-in. deep I-Beam-Lok grids, product of the Carnegie-Illinois Steel Co. Comparative weights of the old and new paving,

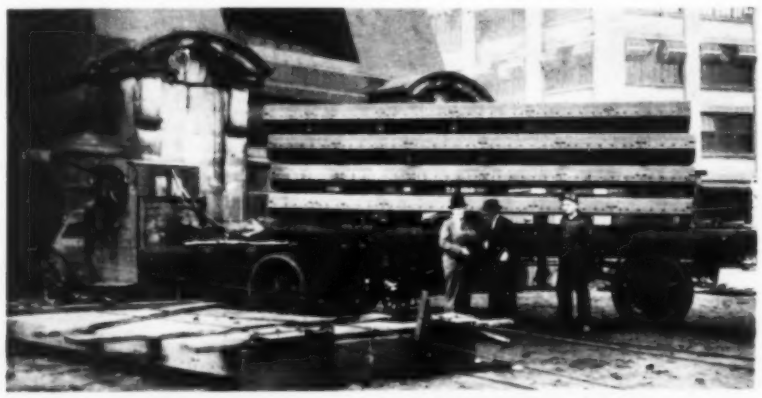




DETAIL of longitudinal joint.

DETAIL (left) of integral steel curb along outer lane roadway slabs of reinforced concrete.

LOWER ROADWAY of Manhattan bridge, showing section of old, worn-out wood block paving in foreground, and new precast concrete slab roadway in background.



LOAD OF PRECAST SLABS rests on truck in storage yard ready to be delivered to bridge as needed.

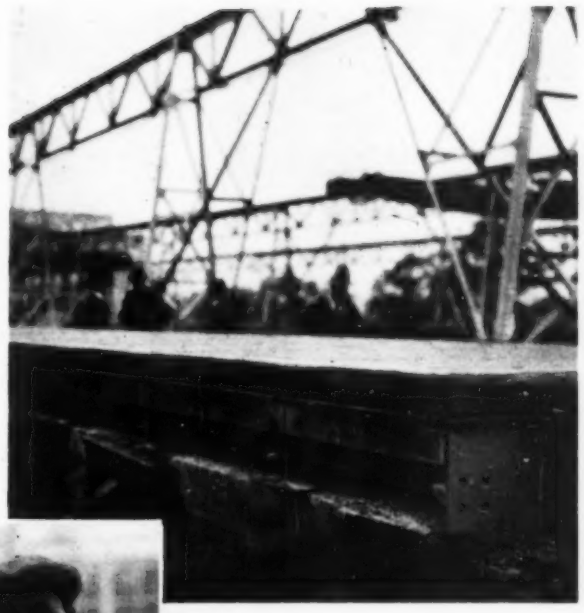
with its structural steel supporting members are: Old roadway, 68.7 lb. per square foot; new roadway 81.6 lb. per square foot, including integral curb and side rail, and 74.0 lb. without curb.

Involving both demolition and new construction, the project required the removal of 87,100 rivets ⅝ in. in diameter, removal and replacement of 188,450 sq.ft. of roadway, placing 1,800 tons of structural steel and 1,640 tons of I-Beam-Lok reinforcement in new concrete slabs, and field welds to anchor the new slabs to the bridge stringers aggregating 8,800 lin.ft.

Cross-sections of the old and the new floor systems are shown in the accompanying drawings. The bridge roadway width of 35 ft. 1 in. is divided into four traffic lanes with slab widths (depending on the spacing of the bridge stringers), as follows: On main and side spans, 8 ft. ½ in. for outer lane slabs and 9 ft. 6 in. for inner lane slabs; on approach spans, 8 ft. 6½ in. for outer lane slabs and 9 ft. for inner lane slabs. Each outer lane slab, it will be noted, is fabricated with a curb and steel guard rail about 2 ft. high as an integral part of the unit.

Reinforcement for the slabs consists of built-up mats of steel I-beams 3½ in. deep, with 3/16-in. webs, spaced 4 in. on centers and locked together by notched cross-bars extending through and welded into openings punched in the tops and bottoms of the I-beam webs. The concrete surface of the finished slabs is ½ in.

RIVETING HAMMER is employed for initial vibration of concrete in forms.



COMPLETED SLAB (right) showing I-beam supports and punched channels along sides fabricated as integral parts of roadway paving unit.

SUPERVISION OF SLAB FABRICATION (right) for Harris Structural Steel Co. is in charge of E. B. WHITE (left) on concreting and W. H. SNYDER on welding reinforcement frames.

above the top of the steel reinforcing grid. With the roadway slabs in place on the bridge the 3½-in. I-beams of the reinforcement extend parallel to the line of traffic. Between slabs there are ⅜-in. joints, both longitudinal and transverse, in which are placed strips of premolded joint filler sealed at the top surface with asphaltic mastic.

Along the sides of each slab are 3½x2½x⅜-in. angle irons underneath which are riveted 4-in. steel channels punched every 6 in. to receive ¾-in. bolts for connecting adjacent slab sections. The ends of each slab are likewise faced with 3½x⅜-in. vertical dam plates welded to the tops of 10-in. channels punched for making riveted connections between slabs at transverse joints. These end and side facings are welded to the steel reinforcing grid in each slab, making a rigid frame within which to deposit concrete. Across the width of the roadway the 10-in. slab-supporting I-beams, bent slightly to conform to the crown of the roadway section, are connected by pairs of ⅜-in. riveted splice plates. Connections between the floor-slab I-beams and the existing 18-in. bridge stringers are made by 2½x5/16-in. welds.

OLD AND NEW ROADWAYS. At left, is section of uneven block pavement where it adjoins new precast slabs. At right entire 35 ft. 1-in. width of roadway is paved with concrete, offering smooth surface to traffic.

Fabrication of Precast Slabs

All of the roadway slabs, 1,176 in number, were fabricated at the modern, well-equipped plant of the Harris Structural Steel Co., whence they were delivered to New York City by motor truck. In the contractor's erection shop, inclosed in glass like a botanical garden, and equipped with overhead traveling crane and other facilities, were laid out a series of four steel I-beam skids set up side by side to correspond with the four traffic lanes on the Manhattan bridge and extending the full length of the shop. On these supports, with the aid of proper jigs, were assembled and welded into complete units the reinforcing mats and structural steel supporting members for the roadway floor slabs. Under the direction of W. H. Snyder, steel assembly and welding were done by a crew of 26 men, including 8 welders using Lincoln "Fleetweld" No. 7 welding rods.

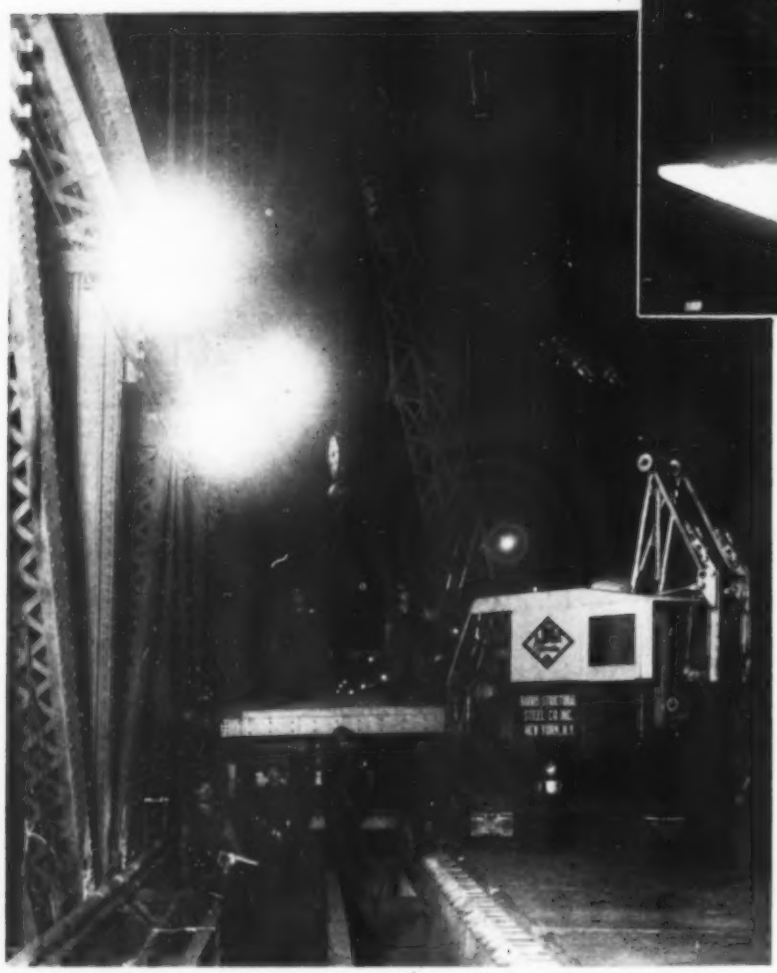
The completed steel frames for

the roadway slabs were then transferred to a set of skids outdoors, alongside the fabricating shop, and lined on the bottom with plywood panels preparatory to pouring concrete into them. An overhead crane runway extended the entire length of the pouring yard and delivered concrete in buckets to the forms. Arriving at the Harris plant in Ransome truck-mixers the concrete was poured into 1½-yd. Blaw-Knox bottom-dump buckets which were picked up by the overhead traveling crane and dumped into the forms. Here, under the supervision of E. B. White, the mix was spread by a hand-shovel crew while the steel frames were vibrated with a riveting hammer to insure filling of the spaces between the heavy reinforcement with concrete. The concrete surface of each slab was finished by a Chicago Pneumatic Co. vibrating screed, after which transverse scoring was done by brooms. The final operation involved the application of the Hunt process in the form of a bituminous film sprayed on to the surface to retain the moisture of the mix and assure proper curing.

Using high-early-strength cement of three brands — Keystone, Incor and Lehigh — and ⅝-in. stone aggregate, the concrete was a 1:1⅝:3¼ mix, with a maximum water content of 37½ gal. per cubic yard. The slump of the mix averaged about 2½ in. It was possible to strip the forms and pick up the slabs for shipment to New York City 24 hr. after the concrete had been poured.

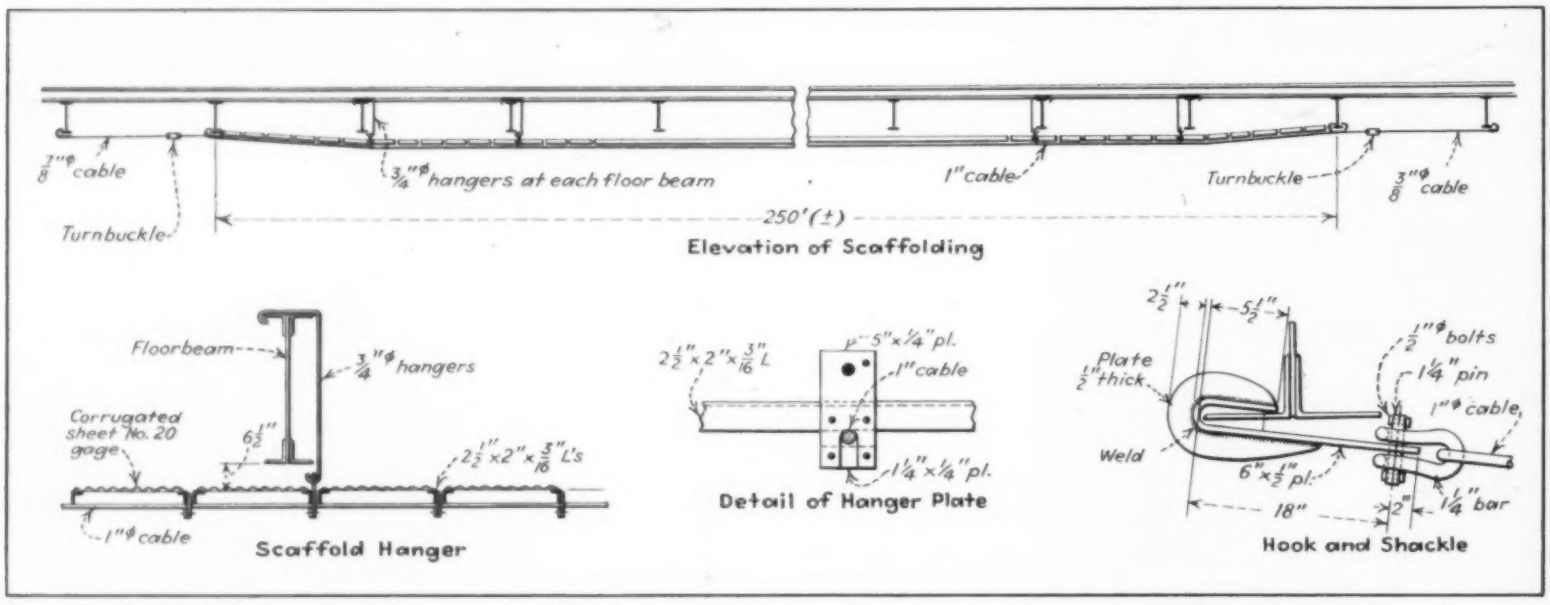
Shipment of the slabs from the plant to New York was done by the Harris organization with its own trucks, as this method of transport, figuring the operating cost of each truck at $25 per day, proved cheaper than movement by rail and supplementary haulage. Each of a fleet of six trucks, carrying three 6½-ton slabs, made two round-trips daily. They deposited the slabs during the day time at a storage yard under the Brooklyn end of the Manhattan bridge from which eight additional trucks, working at night, delivered the slabs, as needed for placement in the

CORRUGATED METAL PANELS (right), suspended by 1-in. cables, serve as fireproof scaffold from which to work on under side of bridge roadway.



OUTER LANE of roadway has been removed and new concrete slab is being lowered to replace it. Old wood block roadway still in place, at right. Work at night offers minimum interference to traffic.

(Continued on page 58)



SCAFFOLD suspended by 1-in. wire rope cables and hangers from bridge floor beams has flooring of corrugated metal panels from which contractor's men work on under side of bridge floor. Special hook and shackle device secures cables to lower flanges of bridge I-beams.

MODERNIZED COLOSSUS OF RHODES

is adapted to construction setting as camera shot catches steel worker, straddling cable reels and signaling to crane operator during construction of Thousand Islands International bridge, recently completed across St. Lawrence River to link United States and Canada.

Photo by Arthur Sasse from International News

J. ARCHER TURNER

Is the Building Industry Awake?

By J. ARCHER TURNER
Vice-President of the Turner Construction Co., of New York City.

THE GREAT problem before the American people today, born out of the experiences of the depression, is how to readjust our industrial and economic life so that everyone may enjoy greater individual security.

Government, management and labor each are striving to bring to light defects that have existed and to apply proper remedies as they see them. Unfortunately, there has not been, and there is not now, proper cooperation with, nor confidence in, one another. Furthermore, there has been recent evidence that the general public is not satisfied with the methods being followed to gain needed objectives. There is evidence of too much reliance on pressure and too little on mutual understanding. Labor, with its newly acquired power, is inclined to take a short-range view with too hasty conclusions and management is unwilling to concede authority where it is distrustful of Government and labor's ability to understand and analyze industry's complex problems. The situation is further complicated by the policy of governmental authorities to force action and to decide later by trial and error if the action taken was sound or unsound.

"The day has arrived when the creation and maintenance of harmonious relations between employer and employee are important functions of management."

If proper corrective measures are to be honestly and soundly arrived at, it is obviously necessary that utmost cooperation must be sought and attained between Government, management and labor. It is clear that each must understand its responsibilities to the other if its influence in the adjustment of the problems is to be rightly used. No longer can the employer assume dictatorial rights over the management of his business, including the assumption on his part of determining the rights of his employees, and, vice versa, labor, if it is to be given greater authority, must recognize its responsibility and properly weigh the problems of management. Mutual respect and understanding must be the keystone in this cooperative effort.

Human Understanding Needed

Thinking from the standpoint of the employer, the day has arrived when the creation and maintenance of harmonious relations between employer and employee are important functions of management. Such a job requires human understanding as well as sound business judgment. Labor relations becomes a far more important job in industry than managership of sales or production.

Back in 1933 and 1934 some of us who were then serving as representatives of the employer on the Regional Labor Boards found ourselves unsuccessful in many instances in convincing employers of this changing situation. In the past, a labor policy limited in its scope to the employment of the maximum amount of help as business volume from time to time warranted, the payment of wages in line with those paid by others in the locality, and with some thought for safe and healthful working conditions, was generally thought to cover management's responsibility to labor. The pendulum is now swinging the other way and perhaps labor is thinking too much about wage rates and hours of employment, and too little about broader policies which may determine management's ability to employ and to pay.

This is the situation facing business today, and the sooner management assumes the obligations of seeking and gaining the good will and the confidence of labor, the sooner will labor sit down at the conference table with an open, unbiased mind and a willingness to cooperate in reaching the right answers to industry's problems. These observations, while applying to industry in general, are equally applicable to the building industry, whose problems are great and difficult of solution.

"The general public feels that building costs are too high and that improvement in design and methods of construction has not kept pace with the advances made in other industries."

Slump in Building Volume

Perhaps no industry in the country has felt the effects of the depression to a greater extent than has building construction. Even so far back as 1926, three years prior to the start of the depression, a decline was observed in the volume of construction work. Despite heroic efforts on the part of our national Government and our state and city authorities, to stimulate building work, volume is still less than 50 per cent of the 1926 volume and private investment ac-

THE AUTHOR

J. ARCHER TURNER'S construction experience dates from 1906 when he started work with Ernest L. Ransome, noted concrete specialist. After serving with the Turner Concrete Steel Co., of Philadelphia, he joined the Turner Construction Co., of New York City, in 1919 and rose through the grades of construction superintendent and general superintendent to vice-president and chairman of the company's executive committee. In 1933-34 he was a member of the Philadelphia regional board of the National Labor Relations Board.

During its 36 years of life the Turner Construction Co. has executed 1,500 contracts for buildings and other structures involving a total of $413,000,000. Notable structures built by the Turner organization include the Port of New York Authority building, Army Supply Base in Brooklyn, N. Y., General Electric Co. plant in Philadelphia, and home office building for the Mutual Life Insurance Co. in Springfield, Mass.

counts for a very small percentage of the work which is offered. With the population of the country steadily increasing and the demand of the American people for better living and working conditions, it is surprising that there has not been a greater increase in private building work. The answer to this lag probably lies in the fact that the general public feels that building costs are too high and that improvement in design and methods of construction has not kept pace with the advances made in other industries.

"At the present time even skilled building labor cannot afford to live in the homes built by its labor."

Here, then, is a capital goods industry that all economic experts agree must recover if general prosperity is to return, and yet, with all types of stimulants being administered, remains sluggish and unresponsive. Statistics show that the building industry is most unstable. Volume of construction work fluctuates tremendously. Failures in building firms are large. Its workshop is a movable one. A construction job may be in one part of a city today and tomorrow in an entirely different section, or in another city or state. The life of one construction job averages much less than a year and when it is completed the contractor may not have another job to take its place in the providing of employment for his workers.

This situation does not lend itself to continuity of employment, the lack of which is a major obstacle to any semblance of security for the worker in this industry. Reasonable continuity of employment in any industry makes for the development of skill and resulting good workmanship and economy in production. It makes for stability in earnings, the lack of which accounts for unsound and unreasonable hourly or daily wage rates. Even the oldest and strongest construction companies, however, have found it almost impossible to maintain any substantial continuity of employment for their skilled and unskilled labor and for their trained office force and directing personnel.

Efforts to Stabilize Employment

Efforts made to stabilize employment, however, have paid dividends by the building of good will with labor and the public. The construction company with which the writer is connected has, since its organization some 36 years ago, maintained a definite labor policy, the essential points of which — besides the payment of skilled and unskilled labor nance of reasonable working conditions — has been the recognition of ability, promotion from the ranks, elimination of favoritism, and the giving of preference to the employment of skilled and unskilled labor from the locality in which the project is being constructed. The maintenance of additional compensation and group life insurance plans for its straight time employees has been another feature.

By the pursuance of the policy of promotion from the ranks 135 of our present staff of 157, exclusive of craft foremen, have been advanced from initial positions of timekeepers, accountants, laborers, carpenters, etc. Of our 66 foremen of skilled and unskilled trades, 54 started with our company as workers in the ranks. We believe these policies have been instrumental in making for harmonious relationship between our company and our employees and greater efficiency and better workmanship has resulted.

"Through expansion of the market, with consequent increase in employment, transition must be made from a high hourly rate with low annual income to a lower hourly rate and a higher annual income."

Such policies of fair dealing pursued by our company and by other construction companies have cemented friendly relations with our employees and with the representatives of labor in the Building Trades Divi-

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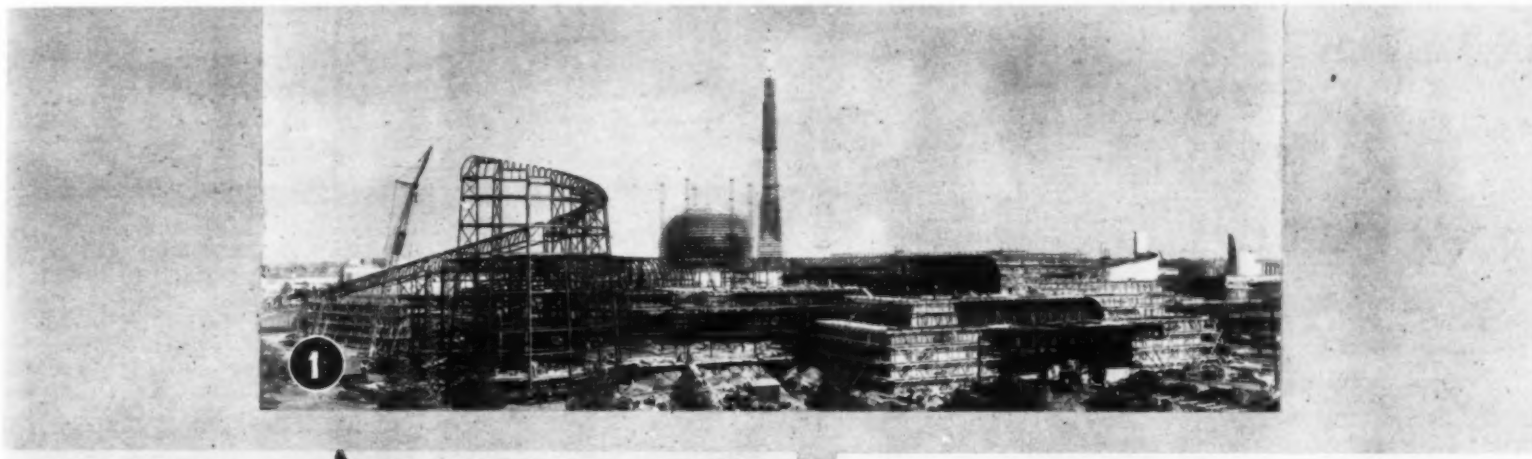
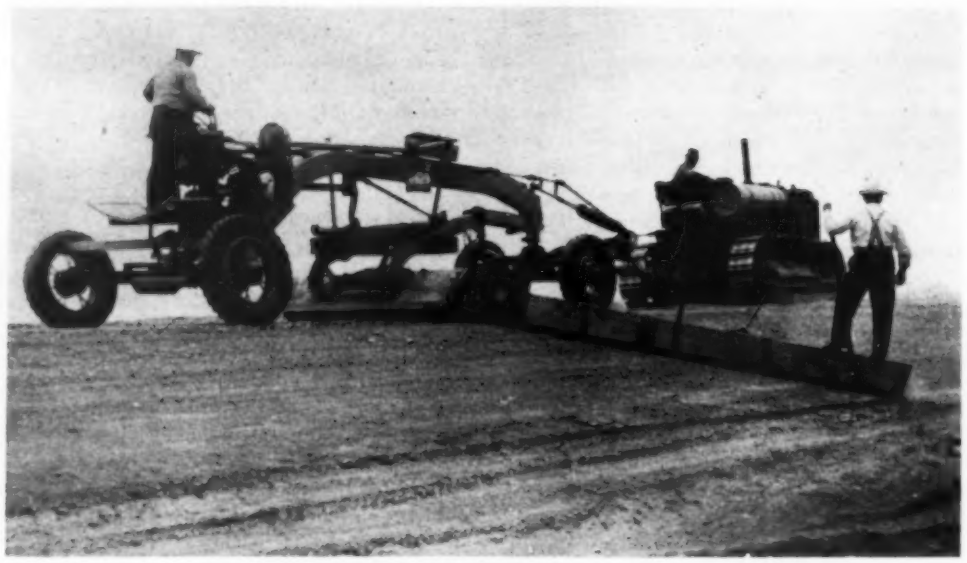


WIDE RANGE OF BUILDINGS and other structures, totalling 1,500 in number, have been erected by the Turner organization during its 36 years of continuous operation. Structures illustrated are: (1) Exposition building for General Motors Corp. at New York World's Fair, 1939; (2) home office for Liberty Mutual Insurance Co. in Boston, Mass.; and (3) building for Boston University.

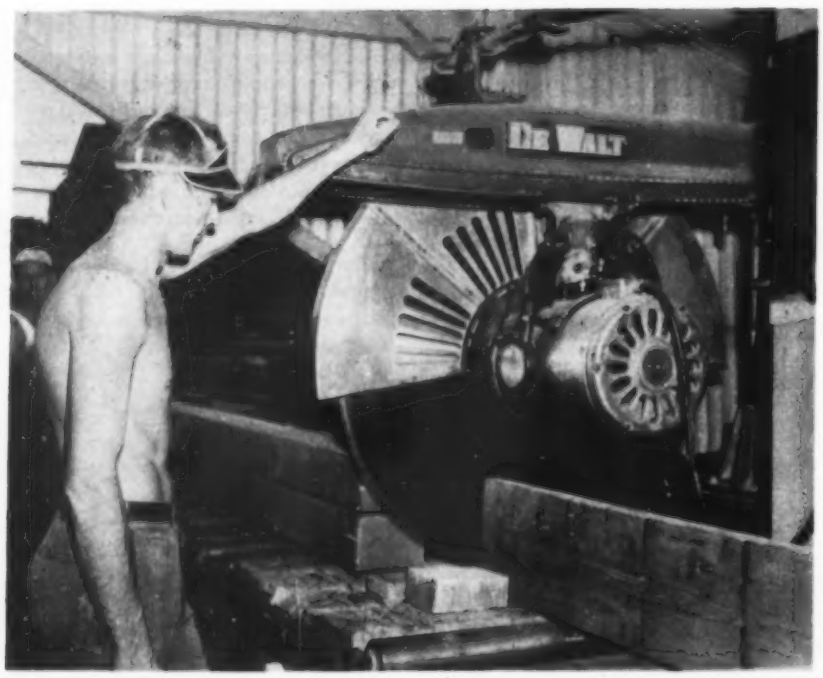
How They Did It

CONSTRUCTION DETAILS

For Superintendents and Foremen

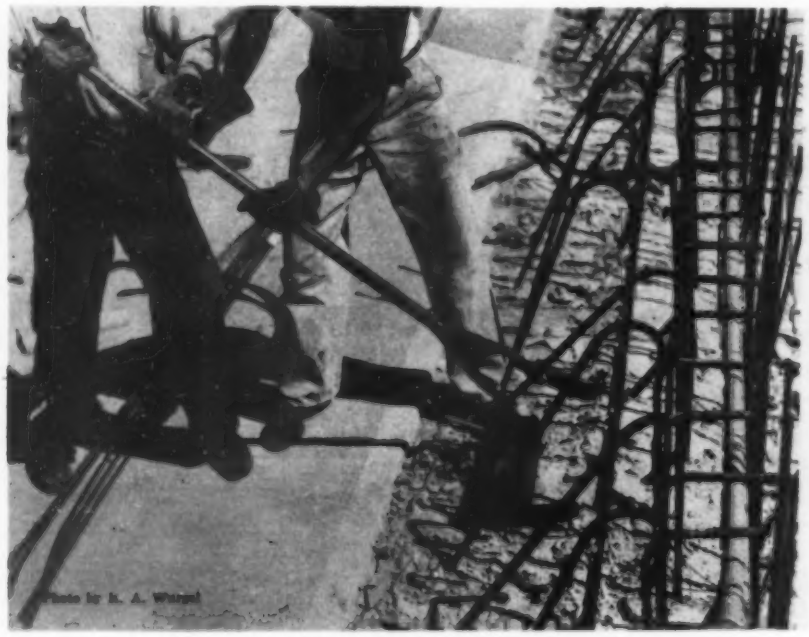


SLOPE-FINISHING ATTACHMENT consisting of 14-ft. plank shod along bottom with bolted steel plate and fastened by means of another steel plate to moldboard of Adams 12-ft. grader finishes long 1 on 4 side slopes for Fahey & Coghlan, contractors, in North Dakota. Draft cable attached to tractor holds plank in position, avoiding excessive strain at moldboard connection.

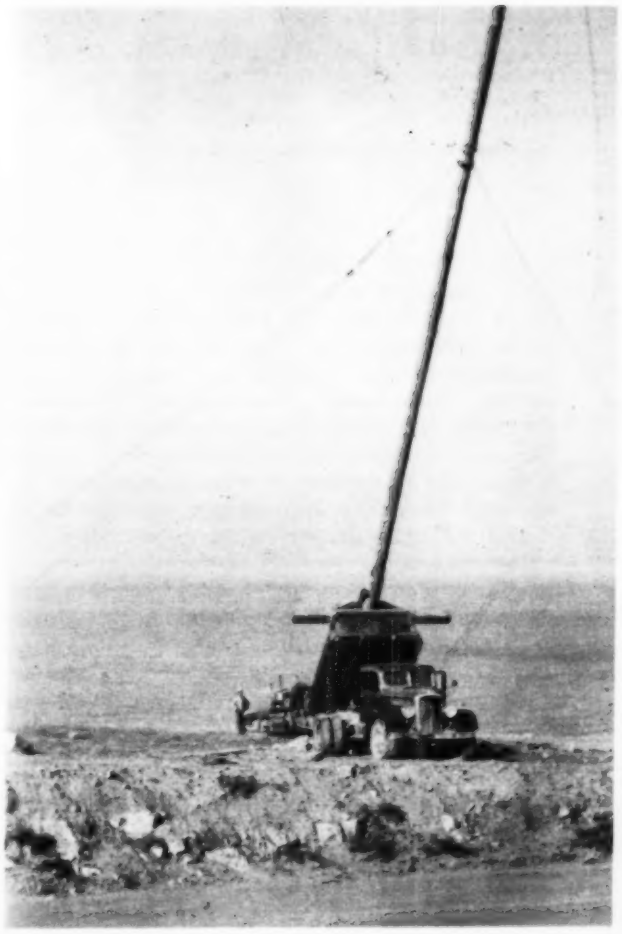


HUGE CIRCULAR SAW, a specially designed DeWalt product, is used by Metropolitan Water District of Southern California to cut 16x16-in. timber at 45-deg. angle in speedy time of 2¼ sec. Top of saw is equipped with special quadrant bar

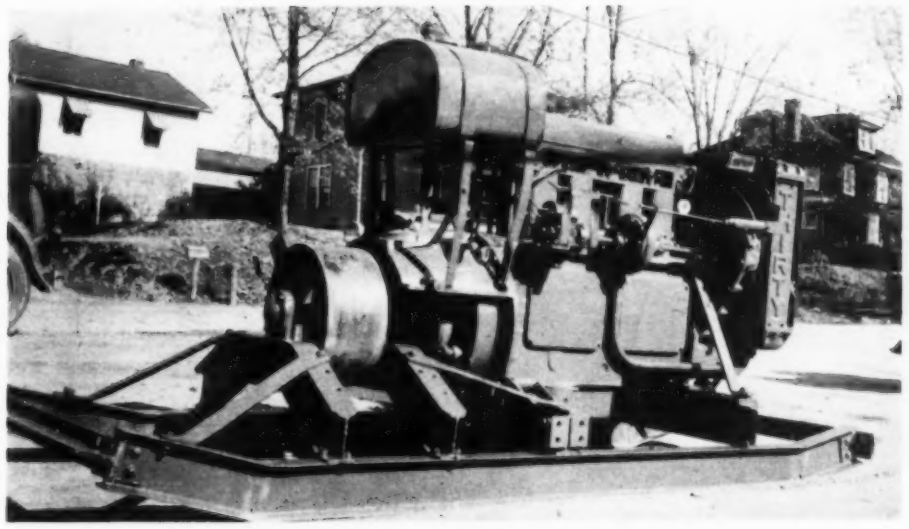
CORE DRILL OUTFIT at work on river bank at Gilbertsville dam site on lower Tennessee River in western Kentucky uses pint jars to hold soil samples from various strata of 90-ft. earth blanket overlying bedrock. TVA core drill crews send soil samples to Authority's laboratories at Norris, Tenn., for analysis.



BAR-BENDING HICKEY (left) designed and used by Poirier & McLane Corp., New York, on Lincoln tunnel approach job in New Jersey, grips bar with two open-socket arms above wooden block jig, equipped with toe piece. Jig serves to guide bending at proper height and angle.

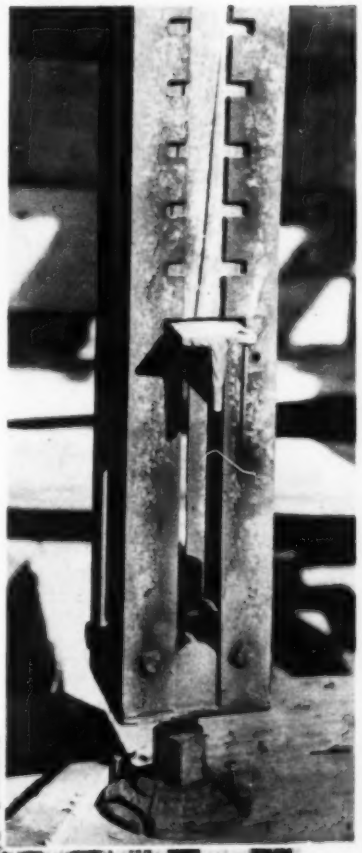


70-FT. POLE to serve as radio antenna is raised by slowly hoisting body of truck which hauls it to site. As pole is raised, workmen slide it into prepared hole.—Photo from J. A. WAHLER, construction engineer, U. S. Fleet Naval Training Base, San Clemente Island, San Diego, Calif.

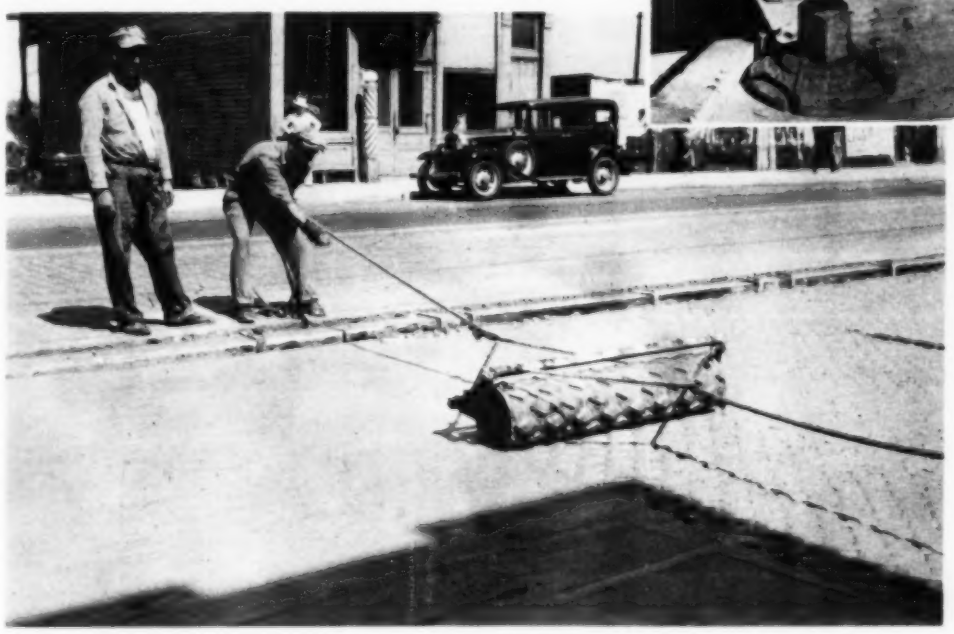


CONVERTED POWER PLANT from dismantled 30-hp. Caterpillar gasoline tractor is hastily mounted on steel skids and fitted with belt pulley to replace original power unit in crushing plant following breakdown. Less than ten days suffices to convert tractor engine and resume crusher operation.—Photo from B. M. CHAPLIN, maintenance superintendent, Monongalia County, State Road Commission, Morgantown, W. Va.

Photo by R. A. Wurgel



ADJUSTABLE SHORE HOLDER (right) manufactured by Universal Form Clamp Co. and used by Poirier & McLane Corp., contractor, New York, has casing of steel angles slotted to support T-iron at various heights, saving cutting of 4x4-in. uprights. Jack screw at bottom takes up fine adjustments when hex nut base is turned with wrench. Pedestal has cast slots for anchor nails to prevent twisting and slipping.



TO ROUGHEN CONCRETE BASE for better bond with binder course of sheet asphalt surface, Illinois Division of Highways on paving of Ogden Ave., Chicago, requires that fresh concrete be rolled with cast-iron cylinder carrying diamond-shaped studs.

BY TELEPHONE signalman directs crane operator who handles steel members, weighing up to 38 tons each, being erected in 3,600-ft. trestle at Grand Coulee dam. From trestle Consolidated Builders, Inc., will place 6,000,000 cu.yd. of concrete in raising dam 300 ft. above completed base 250 ft. high, under direction of U. S. Bureau of Reclamation.

ARCHITECTURAL CONCRETE

for Sears, Roebuck Building Cast in Plywood Forms

CLOSE-UP (left) of finished wall shows faint impression of grain of plywood in concrete. Photograph also shows a wall corner, traceable from apex of shadows of tubular scaffolding. Note sharpness of corner.

ATTENTION TO DETAIL, from the grading of the aggregates to the stripping of the forms, has produced satisfying results in the construction of the Sears, Roebuck & Co. architectural concrete building on Chicago's northwest side. The structure, complete except for interior finishing, was designed by Nimmons, Carr & Wright, of Chicago. Lundoff-Bicknell Co., of Cleveland, were the general contractors.

Experience on the Sears, Roebuck building has demonstrated that it is relatively simple, with careful job control, to obtain straight exterior walls with smooth surfaces, embodying whatever architectural ornamentation is desired. The control necessary to procure a good job divides itself into three major operations: Selection and stockpiling of materials and control of mix; design and erection of formwork; and placement of concrete.

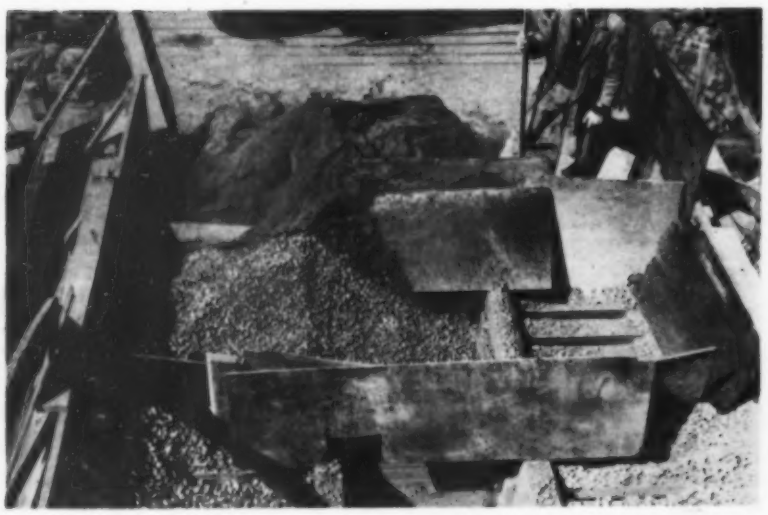
Aggregates and Mix — Stone, sand and cement were hauled by truck to stock bins from which the mixer hopper was fed by gravity. All concrete was mixed in a 1-yd. mixer located in a pit, discharged into a 1-yd. bucket, and handled to successive floor levels from a 140-ft. hoist tower.

Gravel, ranging in size from ¼ in. to 1½ in., was used in the concrete below grade. Above grade, gravel having the same range of sizes was used, but it was divided into two sizes: ¼ to ¾, and ¾ to 1½ in. in order to regulate more accurately the grading of the aggregate from batch to batch.

Accurate control of the mix was obtained by weight batching. The proportioning hopper located above the mixer and under the aggregate storage bins was attached to two scale beams, one for weighing the sand and one for weighing the two sizes of coarse aggregate. This latter operation was quickly accomplished by resetting the poise on the coarse aggregate scale beam after the first size was in the proportioning hopper and the beam had been balanced.

Formwork — In building architectural concrete structures, that is, in buildings in which concrete is the architectural medium and is not covered with any other material, it is essential that forms be carefully designed; that the sheathing, especially where large plywood sheets are used, be placed in a pattern that will result in a

RAMP built over sand and stone hoppers allows trucks to discharge directly into hoppers.



STONE OF TWO SIZES and sand are dumped into separate bins from ramp. Better control of mix assured by stocking two sizes of stone.

SCALE BEAMS at proportioning hopper. Sand is weighed on lower beam and two sizes of gravel on upper beam by resetting poise.

pleasing wall surface; and that the forms be so erected and braced as to maintain straight, true alignment.

Forms on the Sears, Roebuck job were built of structural plywood, ¾ in. thick, in 4x8-ft. sheets. The sheets were set horizontally with the vertical joints staggered. All joints were sealed with a mixture of tallow and cement to prevent leakage.

Studs were 2x4's and 4x4's spaced at 16-in. centers. The 4x4 studs were used every 4 ft. This was done to provide a 4-in. wide nailing surface, thereby avoiding nailing too close to the edges of the panels, which often results in considerable loss of plywood due to breakage in stripping. To insure true surface of walls, vertical liners consisting of two 2x6's were used, spaced on approximate 8-ft. centers.

The ties were spaced 2 ft. vertically and 3 ft. horizontally using double 2x6's for wales. The tie spacing was maintained the same throughout the job as nearly as possible to keep from drilling new holes in the plywood each time the material was reused.

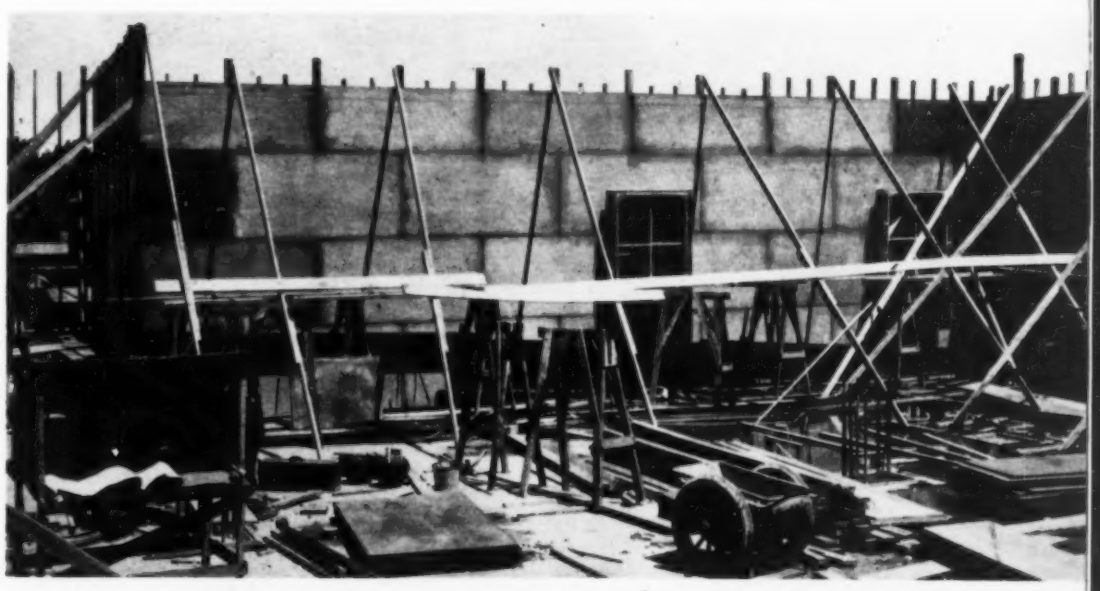
At all construction joints ⅝-in. stud bolts were provided to support the formwork above and to clamp the forms to the hardened concrete, thus insuring a rigid form and preventing any offsetting at the joint, and leakage. The bolts were set at the top of each lift about 4 in. below the joint and about 30 in. apart.

At the beginning of the job several form oils were considered because the oiling of forms for an architectural concrete job is even more important than on a structural job. The concrete must not be stained and the plywood must be given the maximum protection so it will retain as smooth a surface as possible for reuse. Several panels were built using different kinds of oil. On one panel an inexpensive form lacquer was used instead of oil. When the forms were stripped, the concrete which was placed against the lacquered form seemed to have a much better texture, with fewer air holes, and was much lighter in color. Therefore, lacquer was used throughout on the remainder of the job with excellent results.

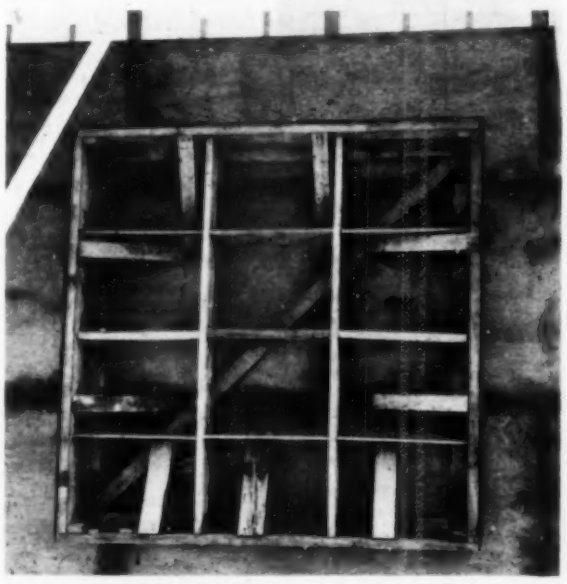
After the outside form had been lacquered and carefully checked, the reinforcing steel was placed. The inside form was then set, leaving clean-outs at intervals so that all sawdust could be cleaned out easily. The first tie was set about 10 in. above each construction joint to make sure that very little pressure was taken by the stud bolts.

To be certain that none of the 1x2-in. wood spreaders was left in the wall, a No. 14 wire was fastened around

EXTERIOR WALL FORMS are rigidly tied and corners are locked and wedged. Note double vertical wales, which assure straight forms and good alignment.

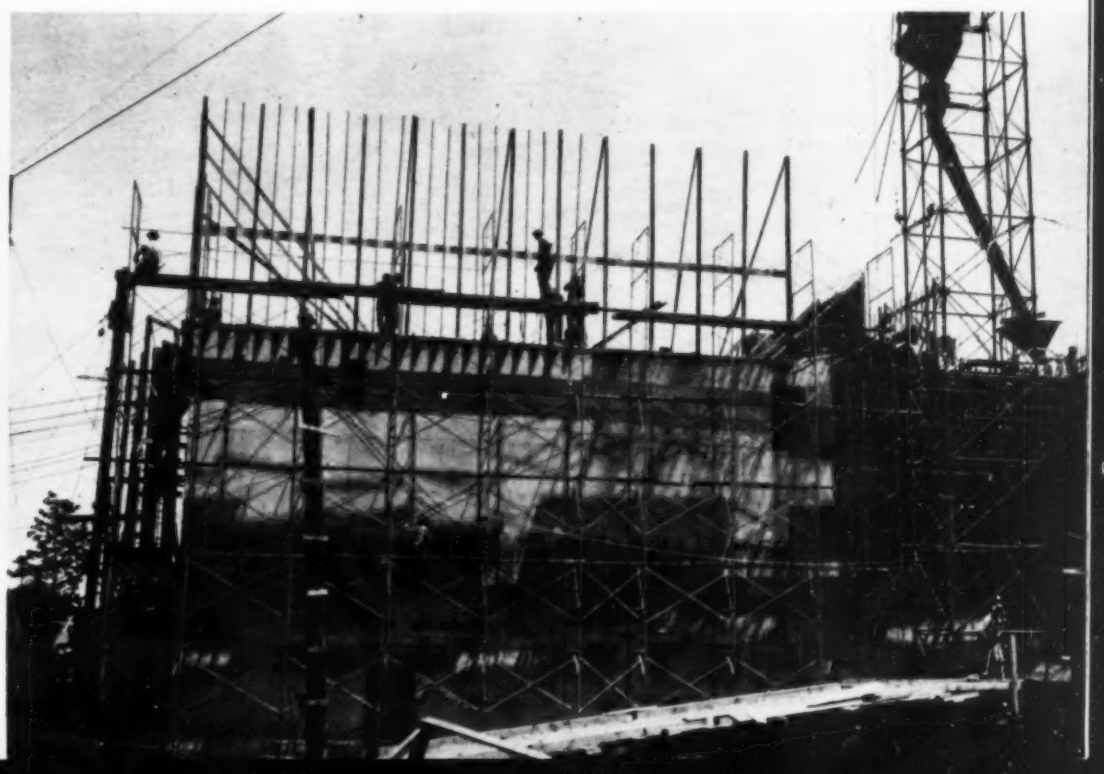


PLYWOOD FORMS. painted with colorless lacquer, form regular pattern, vertical joints in alternate courses being in line. 4x4 studs are used at each joint to provide adequate nailing surface.

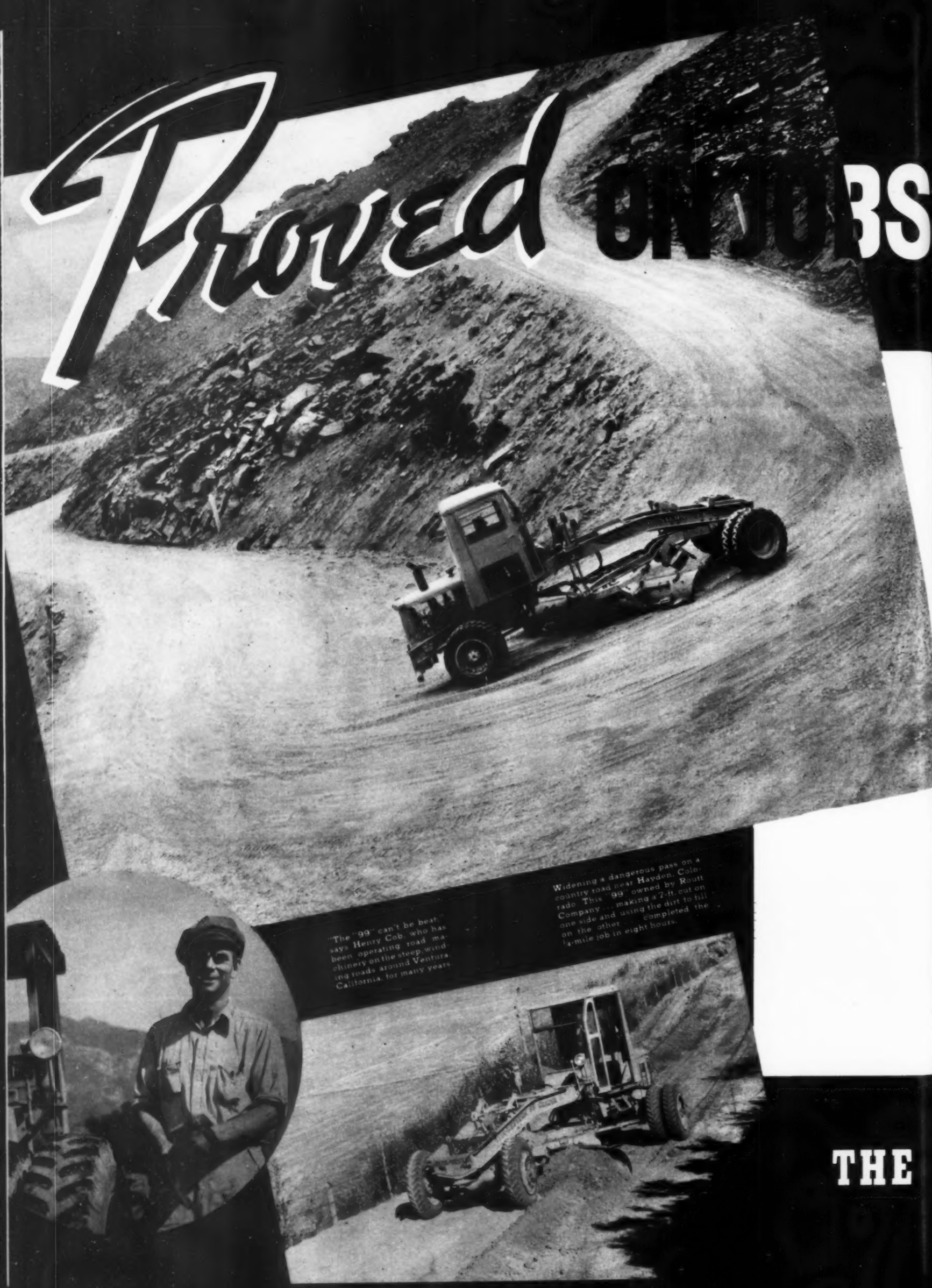


WINDOW BUCKS are securely nailed to form lining, and are braced in all directions to assure rigidity.

FORMS (below) have just been stripped from wall extending from first to second floor. On this section forms were treated with colorless lacquer. Concrete is shown just as it came from forms.



Proved ON JOBS



"The "99" can't be beat," says Henry Cob who has been operating road machinery on the steep, winding roads around Ventura, California, for many years.

Widening a dangerous pass on a country road near Hayden, Colorado. This "99" owned by Routt Company . . . making a 7-ft. cut on one side and using the dirt to fill on the other . . . completed the ¼-mile job in eight hours.

THE

S THAT "CAN'T BE DONE"

● Easily negotiating 8 to 16 per cent grades without stopping, or the blade losing its load . . . working more than fifty hairpin turns without backing . . . the Austin-Western "99" 4-Wheel Drive—4-Wheel Steer Motor Grader is shown above making its first maintenance run up Pike's Peak. The "99" made the climb in second and third gear, at 2½ to 3½ miles per hour respectively.

Your locality and working conditions may not call for such spectacular motor grader performance. But distinctive "99" features that make such performance possible help you do your jobs better . . . do more kinds of work, for more days of operation each year.

With a "99" you can make accurate blade adjustments without stopping . . . turn around in half the time required with a conventional motor grader . . . follow a sharp curving ditch line without backing up . . . pull deeper ditches . . . handle a full load on the blade without side slip and with never a wheel in the windrow.

The greater traction and driving power . . . made possible by 4-wheel drive and steer . . . so multiplies the "99's" fields of usefulness that it often saves the cost of a tractor for bulldozing, pulling a blade grader, a sheeps foot roller, etc.

See this versatile 4-Wheel Drive – 4-Wheel Steer performer in action on all the different jobs it can do for you. Then you'll agree that IT'S THE "99" FOR '39 . . . and for the years to come.

AUSTIN-WESTERN ROAD MACHINERY CO.

AURORA, ILLINOS

CONCRETE was elevated by hoist tower, thence delivered to hopper, and from that to concrete buggies.

ELEPHANT TRUNK is fitted with reducer section. Hopper is 30x16 in., reduced to 4x12.

ELEPHANT TRUNK is pulled from wall by two men after concrete has been placed. It is then moved ahead, one man being able to carry it easily.

TWO MEN slip elephant trunk between reinforcing steel and inside wall form.

CONCRETE (below) is discharged directly into elephant trunk hoppers.

the center of the lowest spreader and run through holes in the ones above. As concrete was placed, the spreaders were knocked out in succession, and the wire was pulled up. At the end of any particular lift the wire was pulled completely out, bringing all the spreaders with it.

Unusual care was taken in forming for window openings. Frames were nailed tightly to the form lining, and rigidly braced to it. This not only made for stability, but assured a sharp edge to the finished concrete around the opening. Waste molds were nailed to form lining for certain special details. Otherwise, all surfaces were cast against wood forms.

Concrete Placing—Best results are obtained in architectural concrete buildings by placing the concrete continuously between construction joints located at the sills or heads of windows or at some well defined level where they will be most inconspicuous. Work on the Sears, Roebuck job was laid out so this was possible, but in some cases, construction joints had to be a full story apart, which was about 20 ft. Concrete should not be dropped farther than 3 ft. To avoid separation of the concrete which would result in stone pockets and to prevent splashing the forms above the level of the concrete being placed, the concrete was deposited through galvanized iron "elephant trunks." Most of the trunks used were 4x12 in. in cross-section, with 30-in. hoppers fitted with reducer sections. The reducers permitted use of a trunk that would best fit the space into which concrete was to be placed. They were made adjustable so that sections could be removed as the concrete was placed. Concrete was discharged directly from buggies to the elephant trunk hoppers. Two men inserted the trunks in the wall forms and took them out when concrete had been placed. One man easily carried them from one point to the next along the wall.

Concrete was handled from a single hoist tower and conveyed in buggies to the point of placement. Buggy runways were elevated above the floor about 18 in., thus allowing floor forming and reinforcing to be placed while walls were being brought to the desired height.

Mechanical vibration, applied to the outside of the forms, was the final precaution taken to insure the best job possible. Vibration was applied with electric hammers against the studs and wales and not against the form lining. At the same time the concrete was thoroughly spaded, dependence not being placed on the vibration alone to compact the concrete and produce the desired perfection of surface finish.

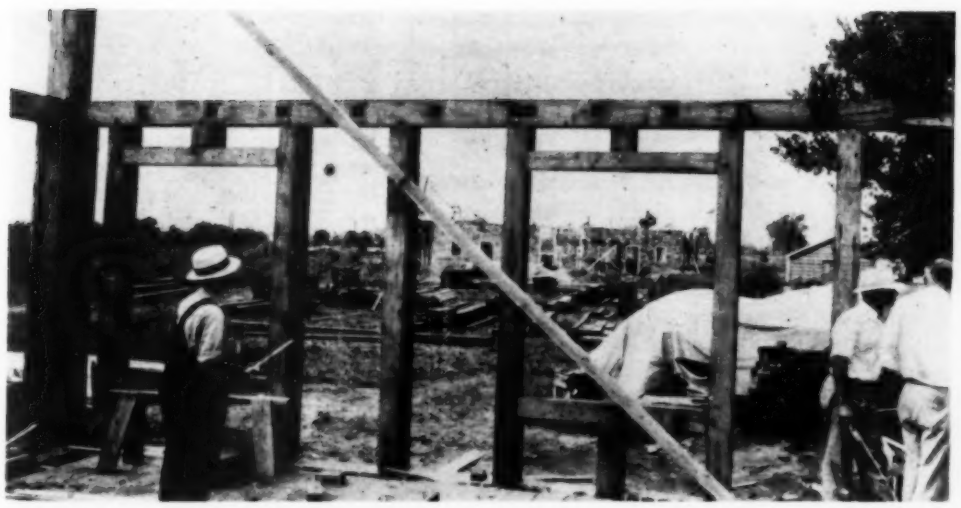
AS CONCRETE IS PLACED in wall, outside form is vibrated with electric hammers while concrete is being hand spaded.

JOB ODDITIES

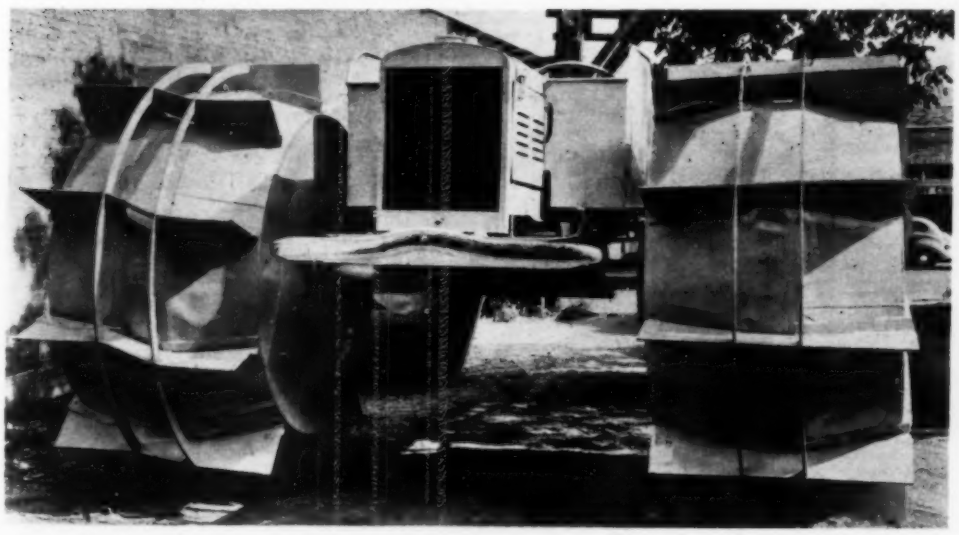
A MONTHLY PAGE OF

Unusual Features of Construction

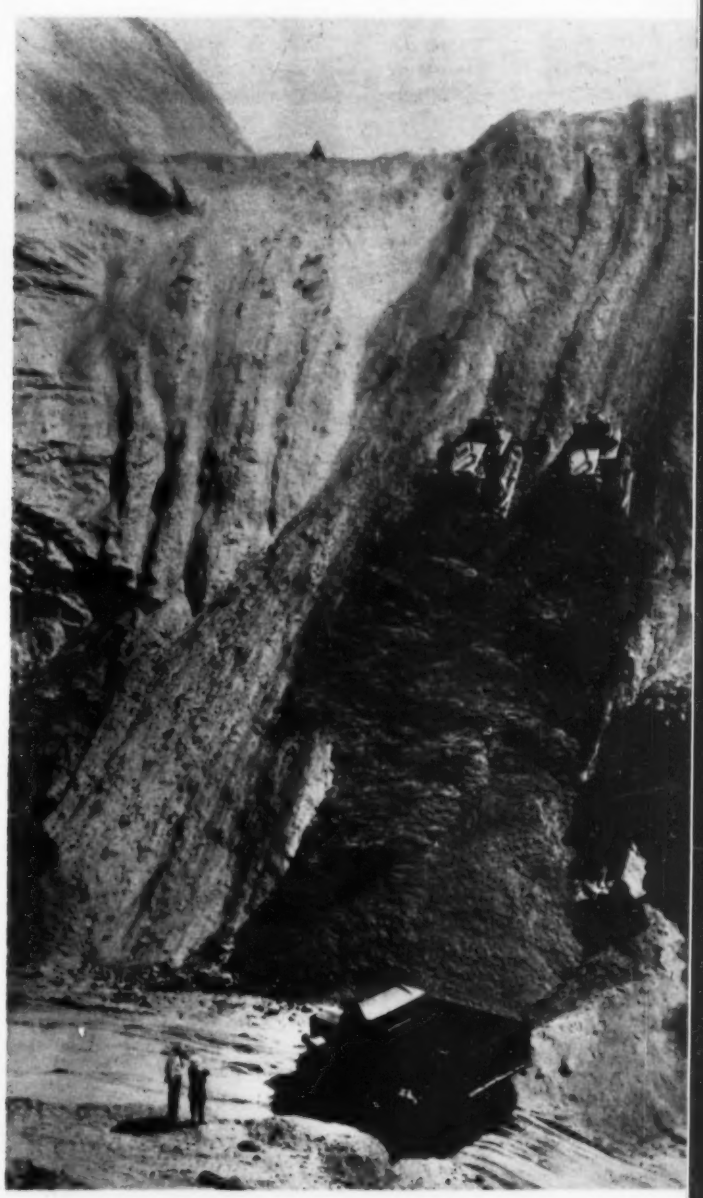
PEDESTRIAN UNDERPASS (above and left) provides safe crossing of main line tracks of Rock Island Railroad at Davenport, Ia. Tunnel with elliptical cross-section was built by jacking Armco multi-plate pipe, 84x96 in., through railway embankment without interrupting traffic.



HOUSE WITHOUT NAILS. In this frame of solid seasoned oak, connections between members are made exclusively with dowels and mortises cut by a Mall electric door mortiser. The mortise is cut by a motor-driven revolving hand-fed cutter which is moved up and down the face by operating a hand crank.



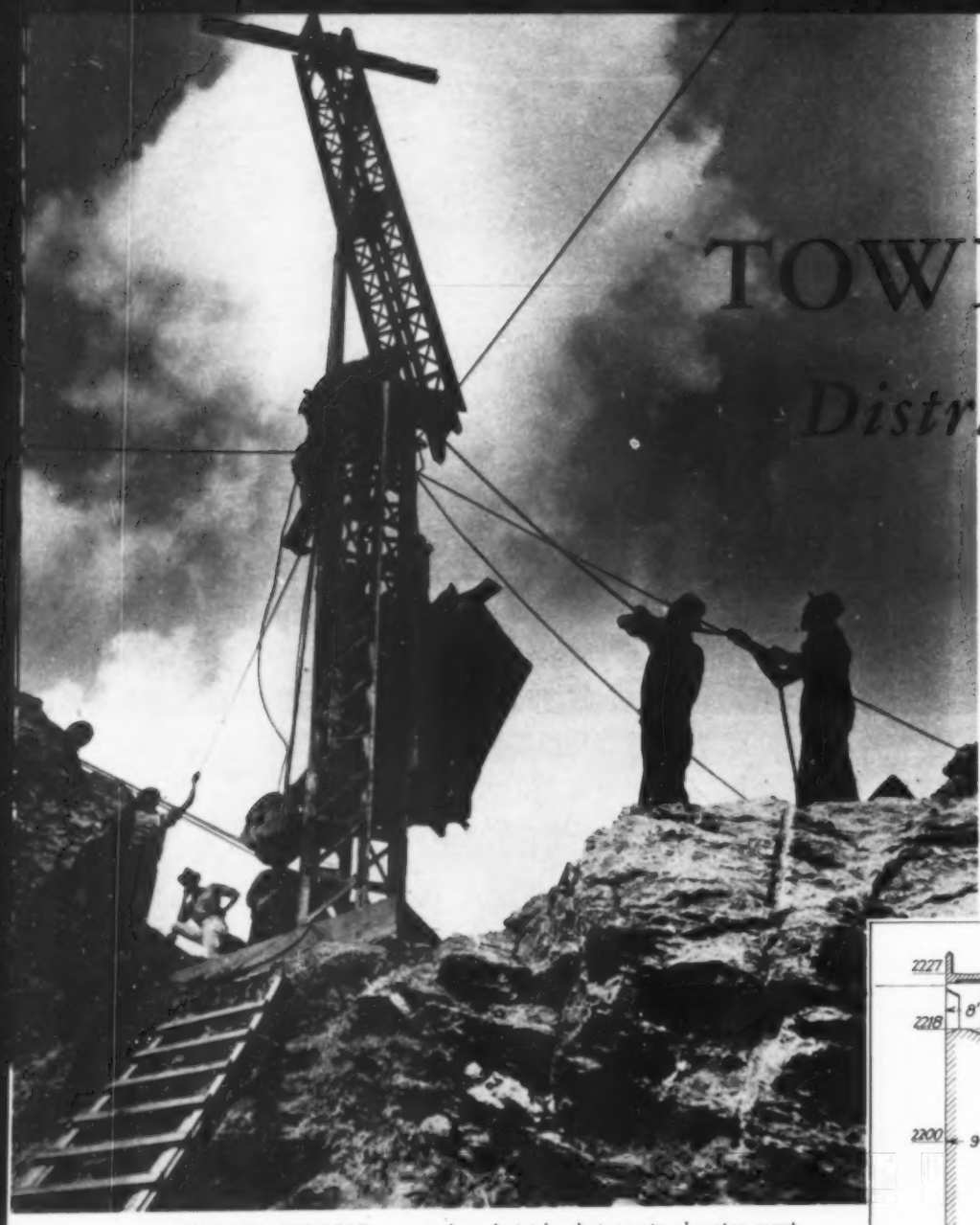
MARSH BUGGY, capable of operating on land or water, is built of arc-welded steel throughout, even to the "tires", which are large steel drums. Amphibian outfit constructed by Stanolind Oil & Gas Co., of Dallas, Tex., weighs 5 tons, will carry 3-ton load and measures 21 by 15 ft. overall. Wheels are 7 ft. in diameter and 4 ft. wide. It is powered by Lincoln Zephyr engine, producing speeds of 2 mi. per hour in water, 7 mi. in marsh and 12 mi. on highway. Machine is welded with Lincoln "Fleetweld" electrodes.



TRACTOR SKI JUMP! Conversion of narrow Newhall tunnel into wide open cut to relieve traffic bottleneck on California highway No. 23 in Los Angeles county required tractor operation at steep grades to push earth down slopes for removal by power shovel and truck. Contract for $410,000, involving 550,000 cu.yd. of excavation, was handled for California's Division of Highways by Griffith Co., of Los Angeles.

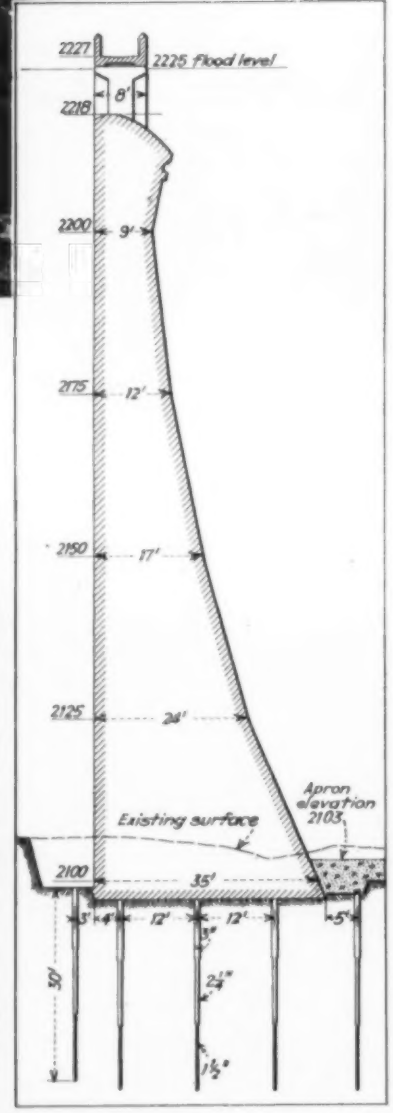
TOWER CHUTES

Distribute Concrete to Thin Arch Dams in Narrow Canyon



MOVABLE GIN POLE mounted on hoist bucket erects elevator mast made up of sections bolted together.

TWO POWER SHOVELS (below) work their way from access road to bottom of canyon at Pt. Lookout dam.



SPILLWAY SECTION of Pt. Lookout dam, showing depth and minimum sizes of grout holes. Behind two rows for upstream grout curtain, holes are drilled as shown where core borings indicate need. Elevations are in feet above sea level.

SKILLFUL MANEUVERING of excavating equipment and compact arrangement of concreting plant laid the necessary groundwork for construction by Ligon & Ligon, Baltimore, Md., and the Sammons-Robertson Co., Inc., Huntington, W. Va., of two thin concrete arch dams in the Dan River canyon of the Blue Ridge Mountains for the Pinnacles hydro-electric development of the City of Danville, Va. One dam, at Point Lookout, completed last winter by Ligon & Ligon, diverts water to a 70-in. pipe line which delivers 2 mi. downstream to a power house with tailwater 703 ft. below crest elevation at the dam, giving this project one of the highest heads in the East. The diversion structure is now known as Townes dam.

A second dam, at Big Bend, 5 mi. upstream from the first, was constructed later by Ligon & Ligon and Sammons-Robertson Co., Inc., to catch and store runoff from the small watershed of the Dan River. Both

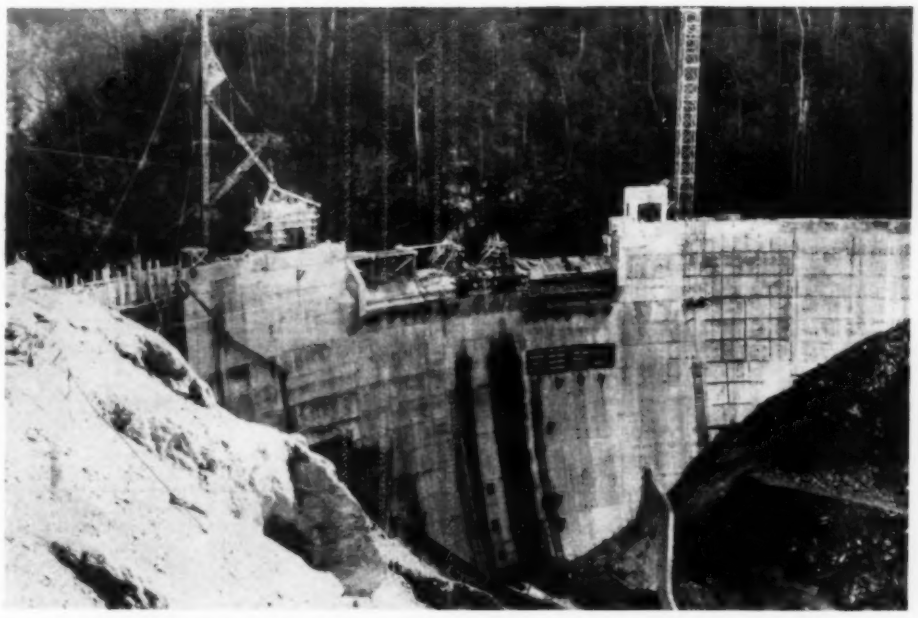
DAM CONCRETE

PROPORTIONS PER CUBIC YARD

Cement	5 bags
Hydraulic lime	1 bag
Dry sand	1,130 lb.
Dry stone	2,210 lb.
Water	40 gal.

Water is limited to 6.31 gal. per sack of cement plus lime. Lime, weighing 62.5 lb. per bag, is equivalent to 0.7 bag of cement.

CORRECTION—In the first article on the Pinnacles Project, appearing in April, 1938, pp. 48-53, the list of ingredients for tunnel lining concrete should be corrected to read hydraulic lime instead of hydrated lime.

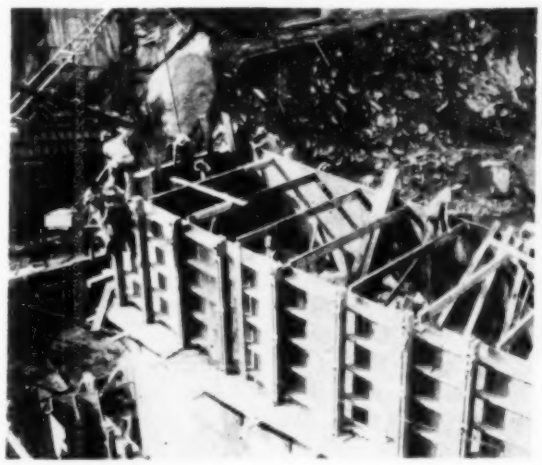


MAST HOIST and tubular elevator tower, located by necessity on upstream side of arch, distribute concrete to structure with crest length of 575 ft. Auxiliary lines from hoist engines change positions of hoppers on elevator units in 15 min. Dam is nearing completion, as signified by construction of gate house and bridge crossing spillway.

ABUTMENT STRIPPING is continued by hand at west side of Big Bend site after power shovel digs its road to bottom. Compressor house sits at top of long flight of steps at right.

dam locations had been opened up for construction purposes by preliminary contracts providing for the grading and surfacing of approach highways. Even with these roads in service, the sites remained relatively inaccessible and difficult, being crowded by steep canyon walls which offered practically no space for plant set-up and materials storage.

Pt. Lookout Dam — At the head of the pipe line is a concrete arch dam 130 ft. high, with a crest 575 ft. long, containing 21,560 cu.yd. of concrete. Foundation excavation involved the removal of 23,000 cu.yd. of unclassified material, of which 17,500 cu.yd. was earth and 5,500 cu.yd. was rock. The dam was bid in by Ligon & Ligon at $461,000 in a

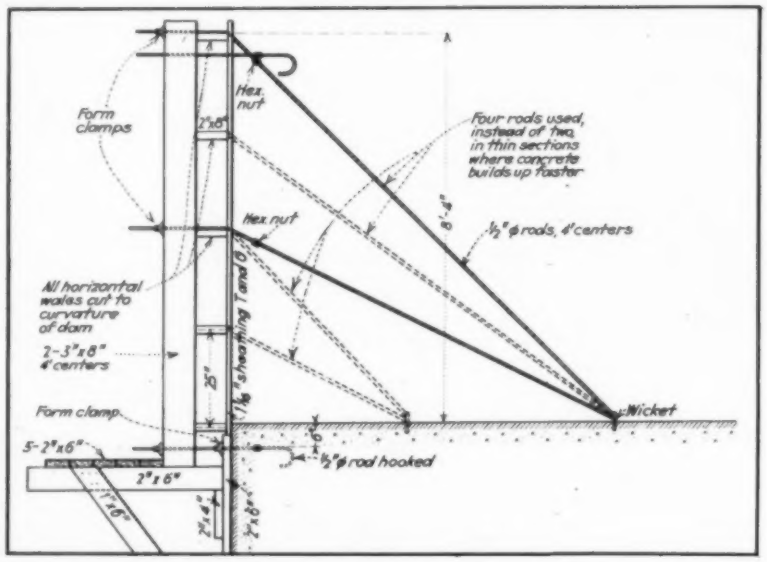


SPACING of form panels is adjusted by spreaders between upstream vertical face and downstream sloping face. Forms are raised from lift to lift by manually operated hoist and blocks suspended from high line.

GIANT STAIRCASE (below) of 5-ft. rock steps is cut in east abutment of Pt. Lookout dam. Tubular hoist tower is in position to distribute concrete on east side of river.

DOWNSTREAM SPOIL BANKS at Big Bend dam are built to height of 45 ft. on both sides of river. Axis of dam crosses stream between truck bridge and footbridge in background.

LINE DRILLING with carriage drills and jackhammers produces clean-cut back faces of steps in Pt. Lookout west abutment.



DAM FORMS for use on successive lifts are designed in panels 40 ft. long by 8 ft. 4 in. high to give three lifts between 25-ft. elevations where slope of downstream face changes.

contract having a total value of $860,000, which included 4,600 lin.ft. of rock tunnels and 5,400 lin.ft. of grade for 70-in. wood stave pipe line. Construction of the tunnels was described in the April, 1938, issue of CONSTRUCTION *Methods and Equipment,* (pp. 48 — 53). The wood-stave pipe was built by the National Tank & Pipe Co., Portland, Ore., under separate contract.

Excavating Procedure — At Pt. Lookout Dam, the access road approaches the site down the west side of the canyon and terminates in a small turning area about 30 ft. above the crest of the structure. A 1½-yd. gasoline crawler shovel started down into the canyon from the road at the top of the west abutment. By side-casting to form a terraced roadway it built for itself a switchback route from the access highway to the bottom of the gorge. After two or three weeks a second shovel, of 1¼-yd. capacity, arrived at the job and traveled to the bottom. A 65-hp. gasoline tractor-bulldozer built the road for the second shovel and spent a couple of weeks pushing material to this excavator on the bottom of the canyon. Earth excavation of the east abutment was handled by a 75-hp. diesel tractor equipped with a trail-builder blade. This unit climbed the east bank and pushed material down to the 1½-yd. shovel.

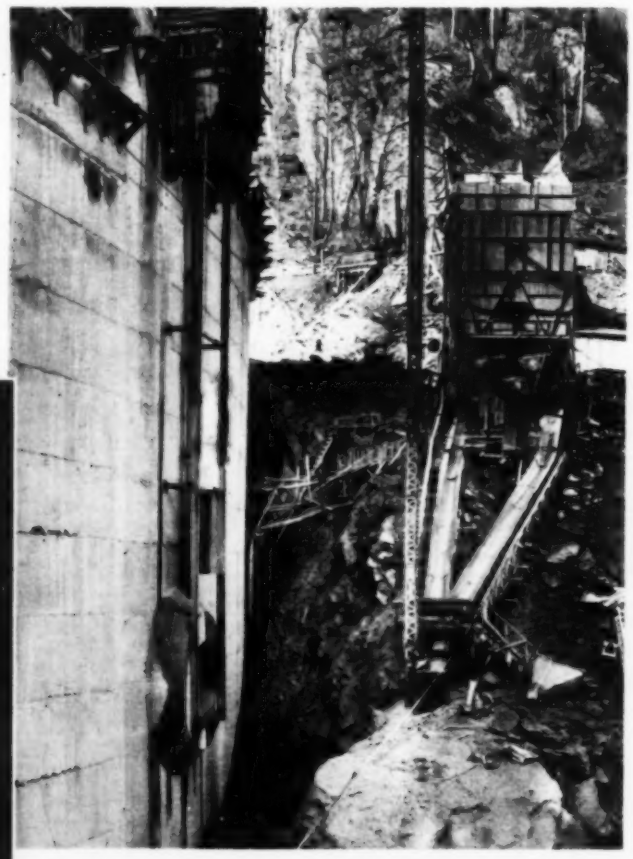
Spoil banks were built on both sides of the river downstream from the dam to pipe line grade, 45 ft. above normal water level. Three 4-yd. trucks and one 1½-yd. truck hauled spoil from the shovels to the two disposal banks. The bulldozer leveled off the dumped loads.

Excavation with the first power shovel started May 1, 1937. From May 1 to June 15, the excavating equipment moved a total of 15,000 cu.yd., averaging 350 cu.yd. per working day.

Stepped Abutments — Steps were

(Continued on page 60)

BRIDGE from access road permits trucks to dump into aggregate bins of mixing plant. Traction boiler on roadway heats aggregates and water for winter concreting. Mast hoist distributes concrete through boom chute and counterweighted radial chute.



MIXING PLANT and steel overhead bins rest on steep earth bank shored against dam structure to prevent sliding toward finish of job. Chutes from two mixers deliver to hopper at base of mast hoist operated from hoist house set between chute lines.

Present and Accounted For

A Page of

PERSONALITIES

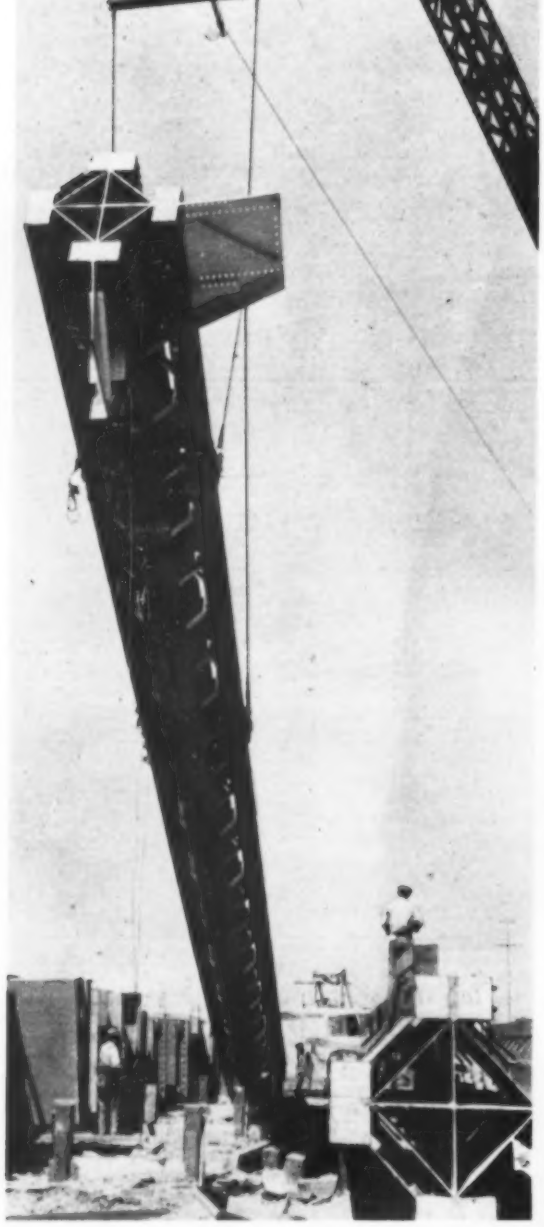
BARTLETT MEMORIAL AWARD for outstanding service in the highway field is presented to FRED R. WHITE (right) chief engineer, Iowa State Highway Commission, by THOMAS H. McDONALD, chief, U. S. Bureau of Public Roads. Ceremony occurred during convention in December of American Association of State Highway Officials at Dallas, Tex.

NOMINEES for president and vice-president, respectively, of the Associated General Contractors of America, to be elected at the forthcoming annual convention in San Francisco in March, are GUY F. ATKINSON (left) head of the Guy F. Atkinson Co., of San Francisco, and H. B. ZACHRY, highway contractor of Laredo, Tex.

HARRY A. LEEUW, of Allen N. Spooner & Sons, Inc., New York contractors, has been chosen president of "The Moles", a newly organized association of men within the metropolitan area of New York City now or formerly engaged in tunnel, subway, sewer and foundation construction, marine or subaqueous work. Among the objects of the organization are promotion of the welfare of construction men, fraternization among members, exchange of construction information, opportunity for contractors to meet engineers, superintendents and skilled mechanics, and maintenance of agreements entered into before awards of contracts. Founders of The Moles include, in addition to Mr. Leeuw, Alexander M. Stagg, of the A. M. Stagg Lumber & Coal Co., and Albert V. Sielke, consulting engineer.

TO PROMOTE SAFETY. Newly appointed executive committee of the Construction Section of the National Safety Council includes: General Chairman, (1) WELTON A. SNOW, safety director of the Associated General Contractors of America, Washington; vice-chairman for heavy construction, (2) R. J. REIGELUTH, of C. W. Blakeslee & Sons, Bridgeport, Conn.; vice-chairman for highway construction, (3) S. E. ANDERSON, Harrison Construction Co., Pittsburgh, Pa.; vice-chairman for U. S. Engineer Department, (4) MAJOR H. B. VAUGHAN, JR., Corps of Engineers.

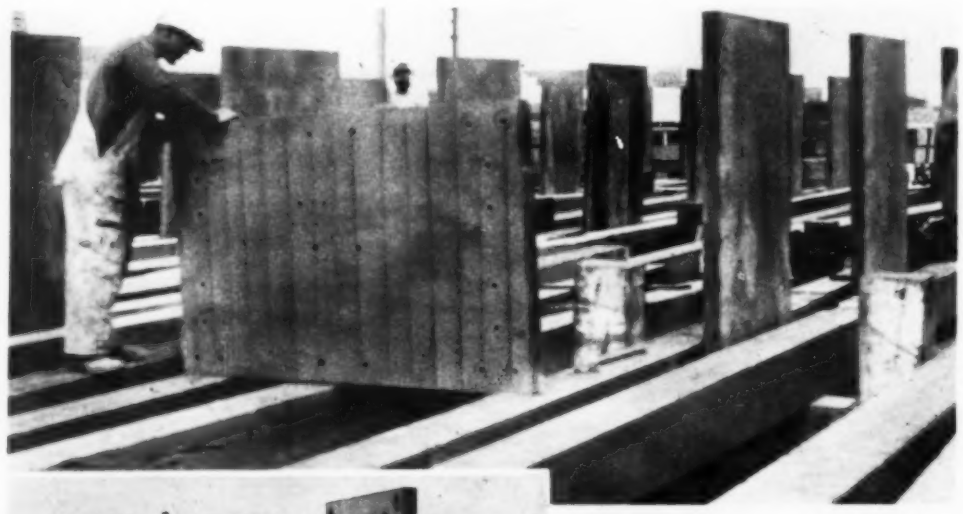
Built-Up Columns 104 Ft. High Are Fabricated With TIMBER CONNECTORS *And Stiffened With* PLYWOOD WEBS



FIRST COMPLETED COLUMN is upended. Member 104 ft. in length is built up with 10x12-in. posts and plywood webs.

PREFABRICATION of 10x12-in. Douglas fir posts involves cutting to exact length, clamping templets to timbers preparatory to drilling holes and dapping timbers for 4-in. flush type shear plates.

SEATING of tall built-up column on its foundation is done with aid of stiff-leg derrick.



WEB MEMBER of plywood prefabricated for use in column.

SPLIT-RING CONNECTORS (left) are used between plywood web members and 10x12-in. timber posts to which they are bolted.

ONE OF THE OUTSTANDING attractions at the 1939 Golden Gate International Exposition in San Francisco will be the Federal Exhibit Building on Treasure Island. This structure, designed by Timothy L. Pflueger, California architect, will cover approximately 7 acres of ground and exemplifies the structural use of Douglas fir lumber and timber connectors in modern building design.

The building, consisting of a colonnade of 48 columns, one for each state, and a series of exhibit rooms for various Governmental activities, will cost $500,000. The colonnade columns will be 104 ft. high, placed in four rows of twelve columns each, with the open colonnade in the center 100 ft. high and 265 ft. long.

Each column will consist of 3-in. hot-plate process plywood webs, arranged in alternate sheets 3 ft. 8½ in. high and 6 ft. long, so that each sheet is at right angles to the sheet below. At the inside corners, where the web members cross, there are four 6x6-in. Douglas fir posts, and at each of the four outside edges of the plywood sheets there are two 10x12's, all vertical members extending the full length of the column. These 10x12's are fastened to the plywood with 2½-in. and 4-in. split-ring timber connectors with ⅞-in. bolts.

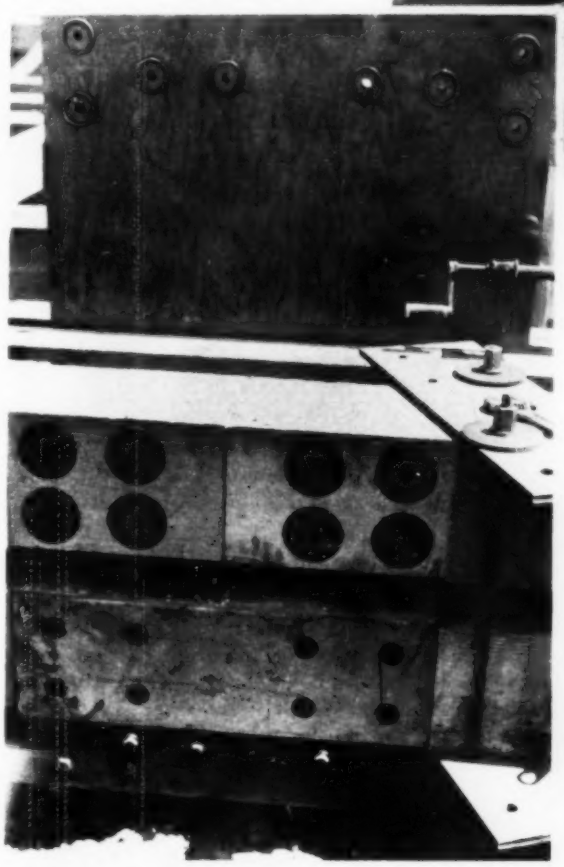
The 10-in. and 12-in. members are spliced twice in their length. These splices are made with steel plates, dapped into the columns to give a smooth surface, and ⅞-in. bolts with 4-in. Teco flush type shear plate timber connectors in the timbers. Ease of erection and dependability of the joints were the primary causes for using the flush type shear plates.

Every 4 ft. in the height of each column a horizontal steel ring is bolted to the 10x12-in. posts, acting as a diaphragm and providing lateral support for the posts.

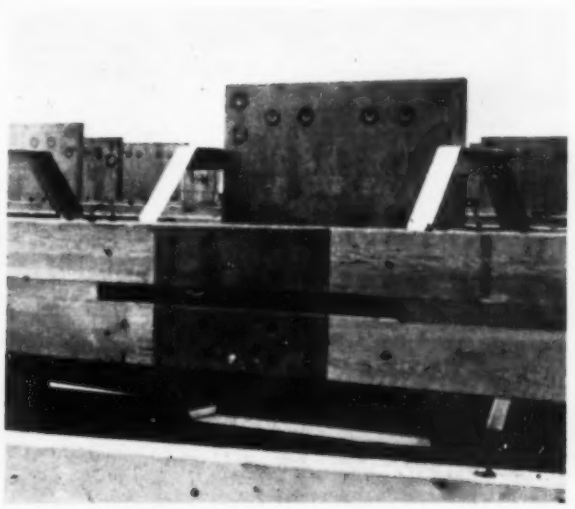
Approximately 550,000 ft. of Douglas fir will be used in the colonnade and about 250,000 ft. of Douglas fir will go into the structural portion of the exhibit buildings, in addition to some 525,000 ft. of construction lumber and plywood. All timbers and the plywood for the

(Continued on page 58)

SPLICE ENDS are fabricated on 10x12-in. posts, timbers being dapped for 4-in. shear plates.

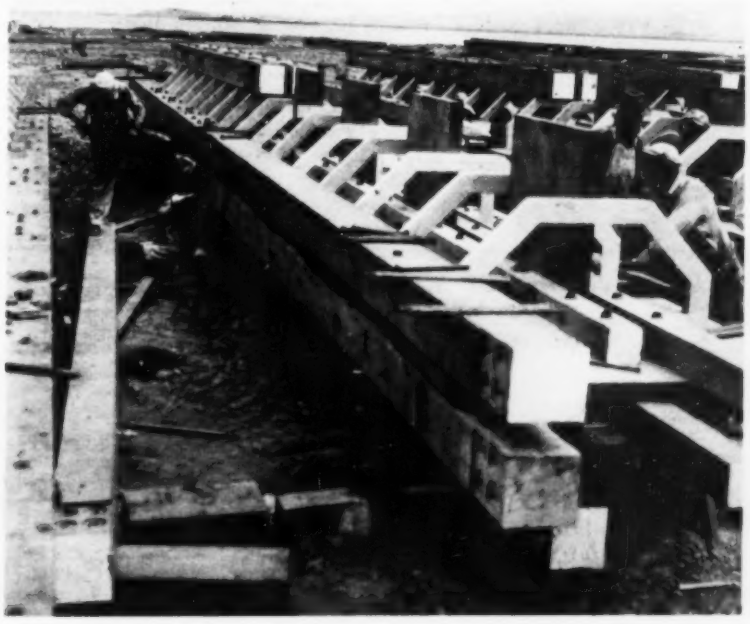


FLUSH TYPE SHEAR PLATES 4 in. in diameter are exposed in upper splice of 10x12's. Steel splice plate and countersunk bolts have been installed in lower splice. Note 2½-in. Teco split-ring connectors in plywood web above timber splices.



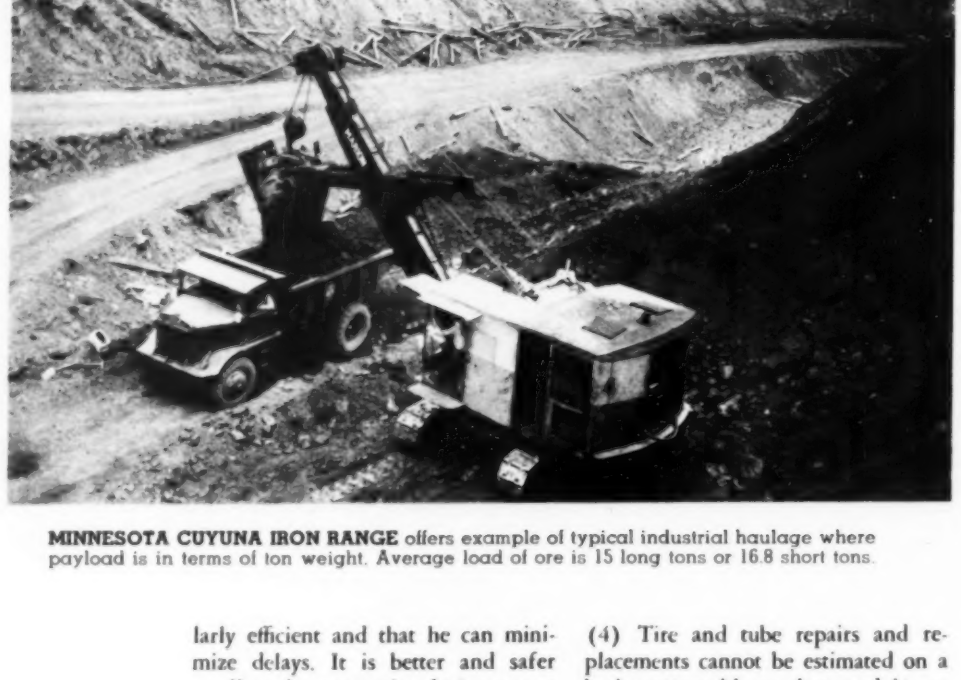
IN FINISHED SPLICE steel plate is flush with outside surface of 10x12's. Countersunk bolts give pleasing appearance to column.

UPPER END of partially completed column showing three pairs of 10x12's and all plywood web members in place. Steel stiffening rings are being installed.



FOUR 6x6's are in place at intersection of plywood web members, while at far end of column upper pair of 10x12's has been installed.

Three Factors Determine *UNIT COST OF HAULING*



MINNESOTA CUYUNA IRON RANGE offers example of typical industrial haulage where payload is in terms of ton weight. Average load of ore is 15 long tons or 16.8 short tons.

By HORACE K. CHURCH
Engineer, Euclid Road Machinery Co., Cleveland, Ohio.

UNIT COSTS OF HAULING depend upon three factors: (1) round-trip time (net or gross), (2) payload and (3) hourly cost of ownership and operation. All three factors merit attention in this final article, which offers comments upon some phases of estimating in the hope that the remarks will be helpful to estimators and to those who interpret estimates. Two factors, round-trip time and hourly cost of ownership and operation, have been rather fully discussed in previous chapters; they receive only brief comment here. Payload, not previously discussed, is given fuller study.

Round-Trip Time — In estimating round-trip time, or hauling cycle, a conservative estimator must make allowances for certain factors affecting each element of the cycle. Among the influences to be given consideration are the following:

(1) Determination of loading time presumes a thorough understanding of material, loading unit and conditions. The tendency is to underestimate, and an error of 1 min. in an estimate of loading time may cause an error of 10 per cent in estimated unit cost.

(2) Estimates of hauling and returning time may be very much in error as a result of the psychological effect upon the estimator of seeing transport units whizzing along at 50 m.p.h. on the highways. The average figure for construction and industrial haulage is about 7 m.p.h.

(3) Dumping time is not a matter of 12 sec. for a rear- or side-dump unit, even though the hoist will raise the body in 12 sec. An average figure is 30 sec., or 0.5 min. For an efficient bottom-dump unit, the dumping time is about 0.2 min.

(4) Turning, if no reversals are necessary, requires about 1 min. Error in appraising the turning circle diameter of a hauling unit may be responsible for a 10 per cent increase in net round-trip time.

(5) An estimator or user must not assume that operation will be particularly efficient and that he can minimize delays. It is better and safer to allow the conventional 17 per cent for delays by using the "50-min. hour."

Ownership and Operation — In making a conservative estimate of the hourly expense of ownership and operation, it is necessary to guard against a number of errors, of which the following are to be noted:

(1) Estimates of depreciation period should be conservative. The rapid development of automotive hauling equipment gives obsolescence an excellent chance to precede actual wear and tear.

(2) Adequate charges must be allowed for interest, taxes, and insurance; otherwise unit cost is fallacious.

(3) Mechanical repairs and replacements (including labor) must be provided for, and the provisions must be liberal if the job is a tough one.

(4) Tire and tube repairs and replacements cannot be estimated on a basis comparable to that used in arriving at highway transport costs. The rolling resistance on portland cement concrete highways is about 20 lb. per ton, but the corresponding value on a rough highway grade may be 200 lb. per ton.

(5) Crankcase oil, hoist oil, grease, and greasing labor must be allowed for in the estimate. Their elimination can influence unit cost by 20 per cent.

(6) Labor troubles, particularly in these times of strikes and union upheavals, can influence both running costs and standby costs because of shutdowns, and it is well to allow liberally for drivers' expenses.

Payload

Because payload is one of the three factors controlling unit cost, as much care should be taken in its estimation

Unit Weights of Materials in Loose Condition with about one-third voids

Material	Weight per cubic yard, lb.	Material	Weight per cubic yard, lb.
Ashes	1,100	Gravel, wet	3,200
Brick	2,700	Lime	1,400
Cement, portland	2,400	Limestone	2,600
Cinders	1,100	Sand, dry	2,600
Clay, dry	1,700	Sand, wet	3,200
Clay, wet	3,000	Sandstone	2,700
Coal, anthracite	1,500	Shale	2,900
Coal, bituminous	1,300	Slag	1,900
Earth, dry	1,900	Trap rock	3,400
Earth, wet	2,700	Mixture of earth and rock, such as unclassified excavation, about	2,700
Gravel, dry	3,000		

Swell Factors for Various Materials

MATERIAL	SWELL FACTOR, PER CENT
Clean dry sand or gravel	14
Loam and loamy soil	20
Common earth	25
Dense clay	33
Decomposed shale and the like	33
Solid rock	50—80

Shrinkage Factors for Various Materials
From Bank to Fill (After Trautwine)

MATERIAL	SHRINKAGE FACTOR, PER CENT
Sand or gravel	8
Clay	10
Loam	12
Loose vegetable surface soil	15
Puddled or tamped clay or clayey soil	25

● **This article, discussing payload and giving an example of how to estimate unit hauling costs, is the fifth and final installment of a group of papers by Horace K. Church on the general subject of automotive haulage with rubber-tired trucks and semi-trailers. Each article is self-contained and is designed to tell a complete story independently of the other chapters. The entire series, considered as a whole, gives a broad and comprehensive analysis of hauling costs, based on 75 detailed field studies of pneumatic-tired automotive hauling units on construction jobs and in open-pit mines and excavations.**

Previous articles appeared in June, pp. 42-43; July, pp. 36-38; September, pp. 56-59 and 62; and December, pp. 46-47, 57-58.

TYPICAL LEVEE BUILDING JOB on Mississippi River employs hauling units rated at 10 cu.yd. with loose loads heaped on 2:1 slope. Allowing 15 per cent of net fill for shrinkage, as required by job specifications, actual average payload is reduced to 6.7 cu.yd., as explained in accompanying text.

as there is in fixing hourly cost and gross round-trip time. Payload is a function of loose load in the hauling unit, and after the engineer estimates or determines the average loose load he can fix the proper value for payload in suitable units.

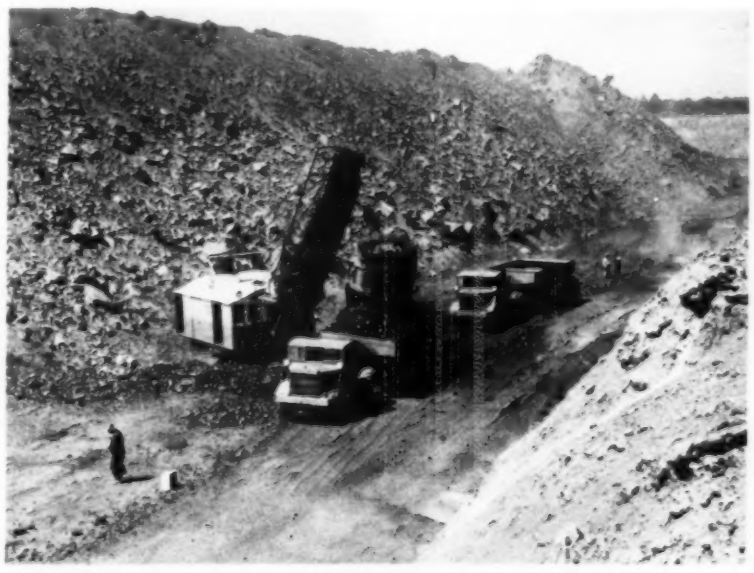
Payload by Weight — In open pits and quarries where the unit of measurement of payload is generally the short or long ton, the payload is easily determined. An accompanying table gives weights per cubic yard for common materials in a loose condition. Variable weights of ores, such as aluminum, copper, iron, lead, zinc, and the like, should be determined precisely for each pit or quarry. Usually, in pits and quarries, the capacity of the unit in tons fixes the capacity in yards, or, conversely, auxiliary plant equipment calls for a load of approximately fixed tonnage or yardage, and the hauling unit is selected accordingly.

It must be emphasized that the true capacity of a hauling unit is in tons and not in cubic yards of material. The fundamental of primarily considering weight, and not volume, is frequently ignored. An automotive rubber-tire hauling unit is the result of engineering design which is in terms of pounds, with stresses in pounds per square inch, just as a steel bridge is the result of engineering design. Hence, when estimating payload, the whole truck structure should be carefully checked for overload.

Payload by Volume — In public and private construction and in some forms of industrial work, the basis of payment is usually the cubic yard, borrow-pit or bank measurement. Notable exceptions are levees and some dams, where the basis of payment is the cubic yard in place in the finished earthwork.

No matter what the basis of payment, there is only one precise method of determining payload, and that is by trial or experience. For exam-

(*Continued on page 66*)



ILLINOIS COAL STRIP MINE is site of another industrial haulage where payload is in terms of ton weight, with average load of bituminous coal equal to 20.8 short tons.

Sample Estimate

PROBLEM: A job involves hauling iron ore from the extreme depth of an open pit 250 ft. deep to a hopper located 1,000 ft. from the rim of the pit. Average production will be 300 long tons hourly, although the loading unit, a 2-yd. shovel, will load at the rate of 7½ long tons per minute. The haul road is reasonably smooth, fairly hard, and partially maintained. Overall hauling distance is made up of:

Level haul in bottom of pit, average	500 ft.
Ramp haul, 10 per cent grade to minimize hauling distance,	2,500 ft.
Level haul from rim to hopper	1,000 ft.
Total distance	4,000 ft.

The proposed hauling unit is a two-axle rear-dump type with diesel engine of 100 hp. at driving wheel-ground contact, weighing 13 tons, hauling average payload of 15 long tons or about 17 short tons and costing about $13,000, delivered price.

It is desired to know the number of units required, the equipment investment and the unit cost. Fleet will work 16 hr. daily, 25 days monthly, and 6 months yearly, or 2,400 hr. annually.

Hauling Cycle

Loading 15 long tons from 2-yd. shovel		2.0 min.
Hauling 500 ft. at 5 m.p.h., speed value estimated	1.1	
2,500 ft. at 5 m.p.h., speed value from performance chart, Dec., 1938, p. 47	5.7	
1,000 ft. at 7 m.p.h., speed value estimated	1.6	
		8.4 min.
Turning at hopper		.5 min.
Dumping in hopper		.4
Returning 4,000 ft. at 10 m.p.h., speed value estimated		4.5
Turning at the shovel		.5
Net round trip time		16.3 min.

Production of One Unit

Loads hauled per "50-min." working hour	3.1 loads
Long tons hauled per unit-hour	46 tons
Number of Hauling Units Required for Production of 300 Long Tons Hourly is 6.5 units. Actually	7 units

Hourly Cost of Ownership of One Unit

Approximate delivered price	$13,000	
Depreciation period	10,000 hr.	
Hourly Fixed Charges		
Interest, taxes, and insurance at 7 per cent delivered price per year of 2,400 hr.	$0.38	
Depreciation, straight-line method with no assumed salvage value	$1.30	
		$1.68

Hourly Operating Expenses of One Unit

Mechanical repairs and replacements (including labor), 10 per cent of $13,000 per 2,000 hr.	$0.65	
Tire and tube repairs and replacements, complete set at $1,500 every 10,000 mi. or every 2,100 hr.	.72	
Diesel oil, 3 gal. at 8c. per gallon	.24	
Crankcase and hoist oil, 0.2 gal. at 50c.	.10	
Grease and greasing labor	.10	
Driver	.80	
		$2.61
Total Hourly Expenses, One Unit		$4.29

Total Hourly Expenses of Ownership and Operation for Fleet $30.23

Summary

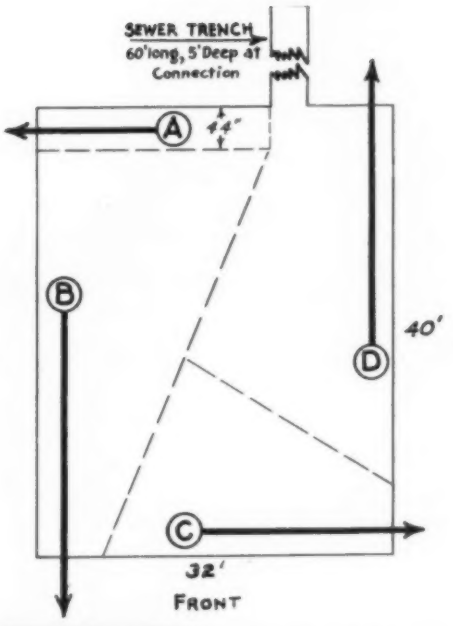
Number of units required for job	7 units
Equipment investment for fleet of seven	$91,000
Unit cost, cents per long ton	10.1 c.

BACKDIGGER

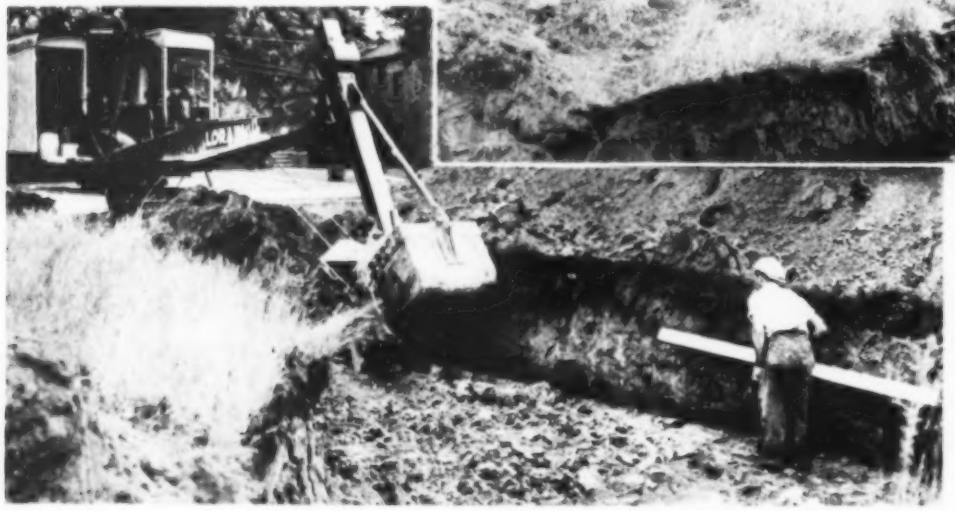
Excavates House Basement in

1 Hr. 45 Min.

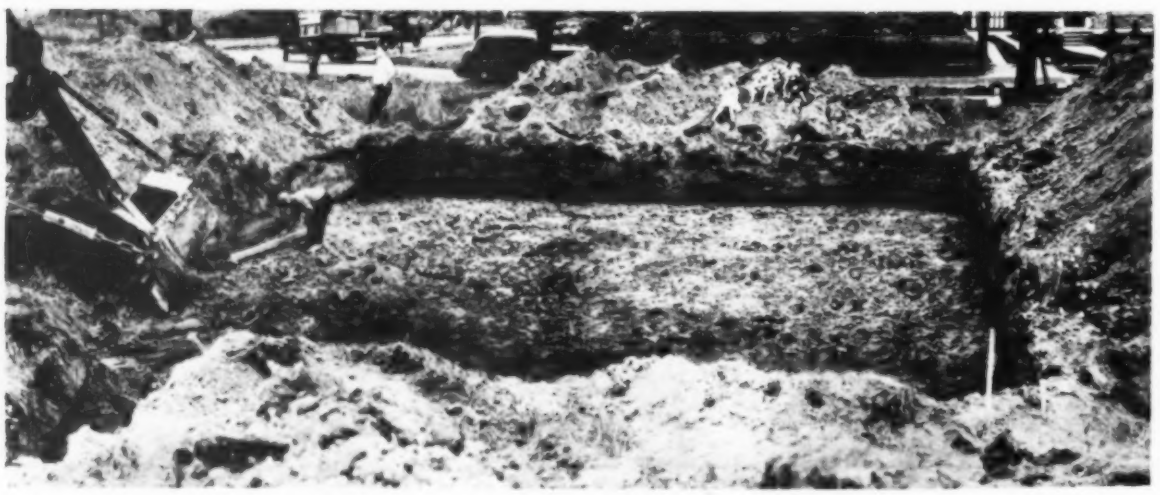
SEWER TRENCH 60 ft. long is excavated to 5½-ft. average depth in 30 min. Tile laying by groundman follows closely behind excavator.



DIGGING PLAN for 32x 40-ft. basement calls for excavation in four moves of backdigger, indicated by arrows, following completion of sewer trench.



ONE MAN ON GROUND (above and at left) takes care of all hand work necessary in directing backdigger operation and in trimming banks and grade. Backdigger excavates Sec. C **(above)** in 15 min., after completing wedge-shaped Sec. B **(at left)** in 25 min.



STRAIGHT VERTICAL WALLS and neat square corners are typical of basement excavation by backdigger, assisted by one groundman who is easily able to keep up with small amount of hand work required in finishing corners and floor grade.

A HOUSING BOOM in the vicinity of Detroit, requiring excavation of thousands of basements, has led ingenious basement contractors to adopt backdiggers for this work. Their choice is the result of the machine's ability to dig basements faster and at lower cost. Accompanying photographs and data illustrating a typical backdigger operation are based on a time study of digging a basement 32 ft. wide, 40 ft. long and 5 ft. deep by Angelo DiPonio, contractor, Detroit, Mich., using a Lorain ¾-yd. backdigger. The contract called for digging the basement and sewer trench and laying the sewer tile.

Digging Plan—A diagram shows the layout of the basement and the digging plan used on this particular job. It should be kept in mind that the digging plan varies on different basements, as required by the presence of adjoining houses, the necessity of piling spoil materials in certain locations for later grading and the need for leaving an exit for the backdigger. In all cases however, the digging plan is basically the same, consisting of digging a trench around the four sides of the basement and scooping out the center. On this job,

(Continued on page 70)

Forward Steps to Greater Safety in Electric Blasting Caps

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ATLAS

EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

MANHATTAN BRIDGE ROADWAY

(Continued from page 36)

bridge, and removed sections of the old flooring as they were cut out.

Placing Slabs in Bridge Roadway

The actual setting of the precast concrete roadway slabs in the bridge, done at night to avoid traffic, involved simple methods and a minimum of equipment, the principal item being a Lima crawler-mounted crane. Using oxy-acetylene torches, the steel members of the old floor system were cut free during the late afternoon so that when the night crew arrived on the job sections of the old roadway could be raised by the crane, loaded on to waiting trucks, and replaced with new precast units picked off of trucks alongside the lane on which work was in progress. Day and night work was scheduled as follows:

Preliminary Work During Day

1. Provide temporary supports for fire and compressed air lines and disconnect existing supports.
2. Remove bolts connecting curb to bridge truss.
3. Remove rivets joining 6-in. I-beams to stringers, and replace half their number by temporary bolts.
4. Clean and paint spaces on top flanges of stringers where 10-in. I-beams of new floor will rest.
5. Disconnect and support electric cables and wires suspended from floor and curb.

Removing and Replacing Roadway, 7:30 p.m. — 7 a.m.

1. Burn through 6-in. I-beams.
2. Remove existing roadway after taking out temporary bolts.
3. Place new roadway unit and clamp temporarily to stringers.
4. Place new curb and temporarily bolt to floor.
5. Place temporary plank at end of night's work on old roadway units, where wood blocks were removed.

Operating on the foregoing schedule the contractor placed about 16 slabs in the bridge per night during the early stages of the work, but increased output until it was possible to set 32 slabs per night. The final slab was lowered into place at 2 a.m., Nov. 18, 1938. As safety measures, the men of the contractors crew were equipped with hard-surface helmets and those assigned to scraping dirt from the top flanges of the existing bridge stringers, prior to placing the new slabs, wore respirators.

Wire Rope Suspension Scaffold

An interesting detail of the methods employed was a special form of scaffold which the contractor developed for hanging underneath the bridge to support workers engaged in cutting out sections of the old floor and replacing them. As illustrated in an accompanying sketch, this scaffold consisted of panels of No. 20 gage corrugated metal sheets bolted to angle-iron frames to form a working platform about 36 ft. wide and 250 ft. long. This working platform in turn, was supported like a suspension bridge by six parallel 1-in. wire rope cables spaced 7 ft. apart and carried by ¾-in. hangers from the bridge stringers. With spans of 250 ft. the cables were made fast, at each end, by a hook and shackle device which was attached to the lower flanges of the bridge stringers. Turnbuckles provided means of adjusting the cables. With the large amount of welding and cutting required on this job the type of scaffold described provided a safe, fireproof suspended platform from which the workers could operate.

Traffic

The scheme of roadway removal and replacement with precast slabs on the Manhattan bridge was designed to offer minimum interference to the flow of vehicular traffic which reaches sizable proportions during rush hours. Traffic counts for a typical 24-hr. period (Oct. 28, 1937) show a total of 82,502 vehicles passing over the bridge; these vehicles included 61,708 passenger automobiles and 20,794 trucks. During rush hours traffic counts for a 1-hr. period between 8 and 9 a.m. showed 7,429 vehicles and between 5:30 and 6:30 p.m., 6,185 vehicles passing across the bridge in both directions.

Personnel

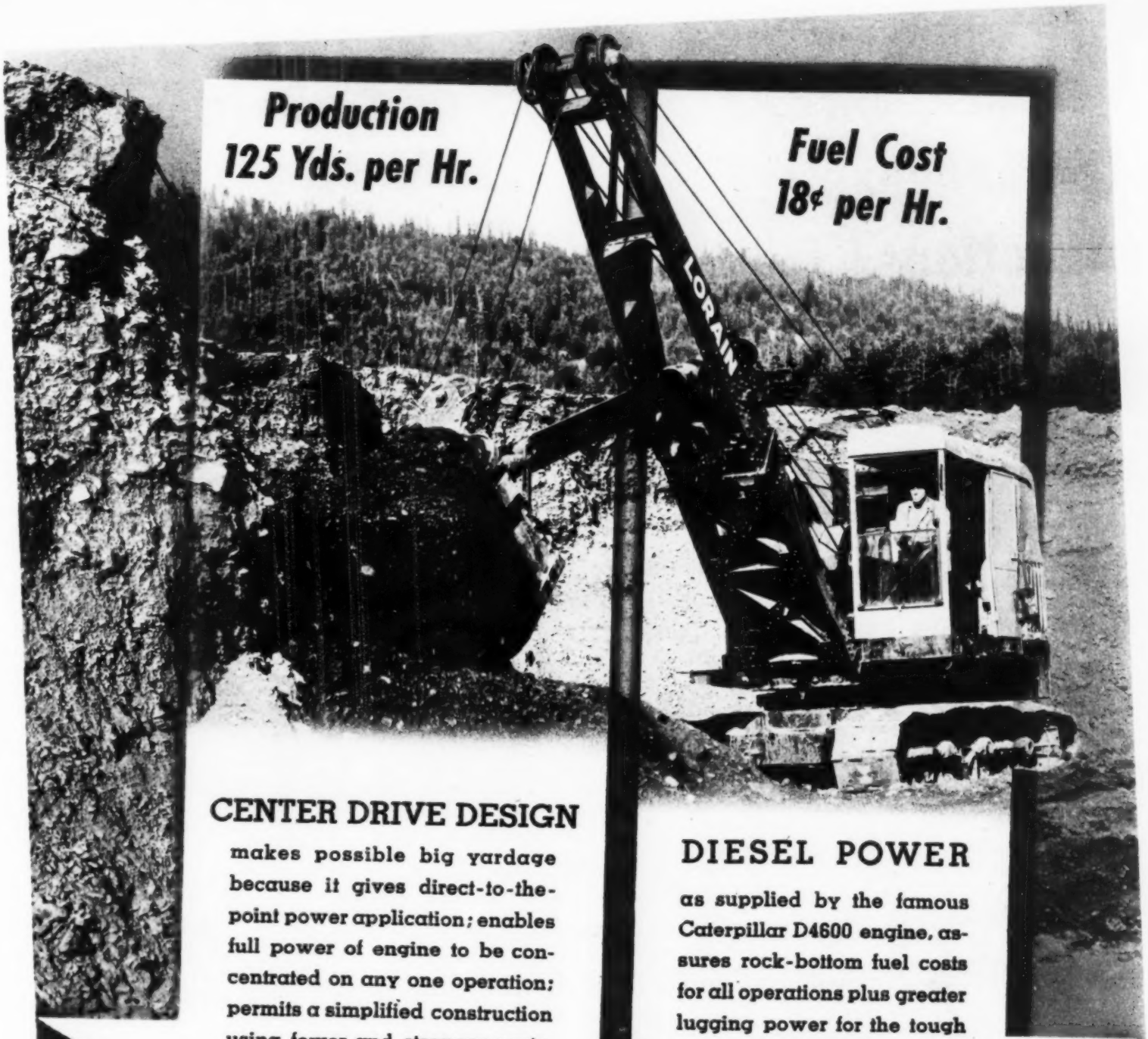
For the Department of Public Works of the City of New York, which has charge of all bridge construction and repair, Samuel Hamburger is engineer in charge of bridge construction and Capt. L. P. Brown engineer in charge of the Manhattan and Brooklyn bridges. For the Harris Structure Steel Co., of New York, operations on the Manhattan bridge roadway replacement were under the direction of Thomas Harris.

Built-Up Timber Columns 104 Ft. High

(Continued from page 53)

columns are being fabricated at the sawmills in the Northwest by Arch-Rib Construction Co., of Portland, Oregon. The hot-plate process plywood has been developed in 3-in. thickness especially for this project by the Harbor Plywood Co. of Hoquiam, Wash.

The structural features of both the colonnade and the exhibit buildings were designed by R. S. Chew, consulting engineer, of San Francisco. The George A. Fuller Co. has the general contract for erection of both structures. Negotiations resulting in the prefabrication and sale of all structural lumber were completed by A. C. Horner of Western Timber Structures. Split-ring and shear-plate connectors were furnished by the Timber Engineering Co. of California.



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IS THE BUILDING INDUSTRY AWAKE?

(Continued from page 39)

sion of the American Federation of Labor. The problem in the building industry is how to extend these friendly relations and how to expand these feelings of mutual confidence into a broad program of research into the ills of the industry — a searching after the truth in an unbiased manner in order to clear the way for increased volume, increased employment and lower costs. Labor in the building industry has been pretty largely organized for many years. Its leaders have had years of experience. They should be better qualified than leaders of labor in other industries to assume the responsibilities jointly with employers in the unbiased solution of the problems of the building industry. They are not unaware of the necessities of the situation.

"The problem in the building industry is how to extend friendly relations and how to expand feelings of mutual confidence into a broad program of research into the ills of the industry in order to clear the way for increased volume, increased employment and lower costs."

Many industries have expanded their volume even in the face of the depression. This is true, for instance, of automobile, radio, refrigeration and air conditioning. This expansion of volume has been accomplished by studying the market, improving methods of construction, and giving the public a better product at less money. These things have been done without sacrifice of employee earnings, but on the other hand the larger market has increased employment many fold. As against these examples, the construction industry has permitted the price structure to rise and the market to diminish.

Low-Cost Housing Market

We hear a great deal about providing low-cost housing for low-income groups. Here is a potential market of enormous proportions, and yet a satisfactory answer has not as yet been found. There has been no evidence that builders and the representatives of labor have made any cooperative effort to develop jointly a design and a program to produce a substantial home to meet the pocketbook of the low-income group. At the present time even skilled building labor cannot afford to live in the homes built by its labor. It seems obvious therefore, that if a larger market for homes and buildings is to be obtained, some means must be found to improve the product and reduce costs to a point attractive to buyers. This is a problem that the employer cannot solve alone. It is a problem that labor cannot solve alone. Both parties must agree, however, that prosperity can return to them only if the market is expanded.

It would be helpful if both parties recognized that a revival of building construction might be brought about through proper cooperation — a cooperation born through necessity and carried through in the spirit of mutual understanding and respect and zeal to find the truth and to apply the remedies. It is useless for the employer to complain about continued demands for higher wage rates and shorter hours of labor unless he can offer some alternative. These demands are but the result of necessity. Dividing up insufficient work is bound to cause short hours and high wages. How else can the worker subsist? Through expansion of the market, with consequent increase in employment, transition must be made from a high hourly rate with low annual income to a lower hourly rate and a higher annual income.

Capital is available if the product offered attracts the buyer. There is a great unsatisfied demand in this country for all types of goods. It is the obligation of the employer and the worker jointly to meet the challenge. Cooperatively the challenge can be met. Is the building industry to move forward with improved and simplified methods, with new and better materials and with more attractive prices, or is it to stand still with capital, management and labor dividing less and less into more and more parts?

Pinnacles Hydro-Electric Development

(Continued from page 50)

cut to a minimum depth of 5 ft. in the rock abutments by line-drilling the back faces of the steps with closely spaced holes and relieving the sides with widely spaced holes. The steps were cut radially into the rocky side walls of the canyon to take the thrust of the arch dam. Jackhammers line-drilled the back face of each step with holes at about 3-in. centers and relieved the upstream and downstream faces with holes on about 2-ft. centers. Blast holes were drilled in the center of each block — usually four in number and never closer than 5 ft. of the back face) and the block was broken with light charges of 40 per cent gelatin dynamite. Careful labor in preparing the steps was rewarded with beautifully carved giant staircases in the abutments.

Foundation Grouting — A total of 1,000 lin.ft of diamond drill core holes 50 ft. deep explored the sound rock (mica schist) foundation of the dam. Carriage drills put down holes for grouting

(Continued on page 62)

CUTTING

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LOADERS for lowest cost loading

Vertical Boom DITCHERS

Low Cost-High Quality Road Construction

(Continued from page 60)

the foundation where indicated by the core drilling. To form an upstream grout curtain wall, the drills sank two rows of holes, one row 3 ft. above the upstream face and a second row 2 ft. back of the upstream face. Altogether the carriage drills put down 16,000 lin.ft. of grout holes 30 ft. deep, starting each hole with a 3-in. bit and finishing with a 1½-in. bit.

Grout was made in the proportions of one bag of cement to 10 gal. of water, with no sand. Two 7-cu.ft. grout machines connected into a wye gave continuous grouting at each hole. Grouting pressure started at 30 lb. and increased to 100 lb., the latter pressure being maintained for 15 min. after refusal of grout. The grouting operation took 2,900 sacks of cement in all, the maximum for one hole being 120 bags.

Concrete Plant — To avoid interference with pipeline construction on the downstream side of the dam, the elevator units of the concrete distributing system had to be set on the upstream side of the arch, with consequent reduction of effective radius for the chuting equipment. A concrete mixing plant equipped with two electric-motor-driven 1-yd. tilting mixers was erected on the steep earth slope below the access road. Power for the mixer motors and for lights was supplied by a 75-kw. generator driven by a 110-hp. diesel engine. Trucks backed over a pile trestle from the access road to dump aggregates into 300-ton-capacity steel storage bins of the plant, and cement was delivered over a truck ramp to a shed on a level with the mixers. Two chutes supported on the steep slope delivered concrete from the mixers to a common hopper at the base of the first elevator unit.

Make-up water for the concrete and for other purposes, such as curing, was supplied by a 1½-in. two-stage electric centrifugal pump, driven by a 220-volt 60-cycle 15-hp. motor, capable of pumping 100 gal. per minute through 3-in. pipe against a 500-ft. head and maintaining 100-lb. pressure at the nozzle. The pump was not working against so much head at this location, but the contractor used no storage tank, as the pumps maintained pressure at the valves at all times.

Below the concrete mixing plant on the west side of the canyon the contractor erected a 160-ft. Insley mast hoist plant which placed the concrete in the west half of the dam and passed the concrete for the east half through a long chute line to a Jaeger-Lakewood tubular tower set up on the other side of the river. Each of the elevator towers was equipped with an adjustable boom chute and a counterweighted swivel chute for distributing concrete over a wide area. All chutes were 14 in. wide and were set at a 1 on 2 slope. Because of the harsh aggregate used in the mixture, the concrete sometimes refused to slide in the chutes.

Concrete Forms — Concrete was placed in the dam in blocks 40 ft. long by 8 ft. 4 in. high. An accompanying sketch shows the type of forms used. Height of the forms was set at 8 ft. 4 in. to give three lifts between changes in batter of the downstream face; these batters change at 25-ft. levels in the dam. Workmen puddled the concrete with boots as it was being placed; no mechanical vibration was used.

Cold-Weather Concreting — Winter concreting was necessary for three weeks in December as the dam approached completion. The 300-ton bins held sufficient aggregate for one day's operation during this period. A 40-hp. traction boiler supplied steam to jets for heating the aggregate in the bins at

(Continued on page 64)

Excellay *Preformed* Wire Rope reduces equipment operating costs

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UNITED STATES STEEL

(Continued from page 62)

night, but the boiler did not have sufficient capacity to continue this heating during the day when the steam supply was used to raise the temperature of the water in a 1,000-gal. tank to 140-150 deg. F.

Concrete came out of the mixers at about 70 deg. and was placed in the forms at a minimum temperature of 50 deg. Fresh concrete was covered with tarpaulins and was kept warm by salamanders. Using these methods, the contractor placed concrete when the atmospheric temperature was as low as 20 deg. F. without experiencing any difficulty from freezing.

Concreting Progress — Progress in placing concrete was delayed by the thin dam section and by the difficulty of maintaining an adequate crew of carpenters in this inaccessible mountain location. Concreting started Aug. 4, 1937. By Dec. 23, the contractor had placed 21,560 cu.yd. in the dam. During this time, the construction crew placed concrete on 107 days, an average of 202 cu.yd. per day. The maximum amount placed in any one day was 446 cu.yd. in 13 hours.

Concrete Mixture — Proportions of the concrete mixture, designed for a compressive strength of 3,000 lb. per square inch in 28 days, are given in an accompanying table. Test cylinders showed average strengths of 4,500 to 5,000 lb. Coarse aggregate was crushed quarry granite of 2½-in. maximum size produced at a site about 15 mi. from the dams. The sand was a sharply abrasive material made by crushing flint fieldstone. This material wore out the blades of the two mixers during the construction of Pt. Lookout Dam. Hydraulic lime is added to the concrete mixture to improve its workability.

Big Bend Dam — Built at a location about 5 mi. upstream from the first dam, Big Bend Dam is 140 ft. high, with a crest length of 510 ft., and contains 30,500 cu.yd. of concrete. Methods and equipment employed at Pt. Lookout were used again on this structure to prepare foundations and place concrete. Excavation for the structure involved an estimated quantity of 6,000 cu.yd. of earth and 21,000 cu.yd. of rock, with an additional 1,100 cu.yd. in the abutment steps.

A compressor plant made up of a battery of three portable machines provided a capacity of about 800 c.f.m. for rock drilling. The battery comprises two Ingersoll-Rand 315 c.f.m. compressors, one driven by a gasoline engine and the other by a Waukesha Hesselman diesel-fuel engine, and a smaller gasoline-powered compressor.

Better utilization of the concrete distributing system was possible at Big Bend Dam, where the tower elevators are set on the downstream side of the dam. The height of the mast-hoist tower was increased to 200 ft., but otherwise the concreting equipment remained much the same.

Big Bend Dam was bid in by the combined firm of Ligon & Ligon and Sammons-Robertson Co., Inc., at a contract price of about $572,000. As only 300 calendar days were allowed for completion, the contractor planned operations to improve concreting progress on this dam.

Administration — The Pinnacles hydro-electric development was built by the Electrical Department of the City of Danville at a total cost of $3,405,000, financed by municipal bond issues and by a PWA 45 per cent grant. Chas. T. Main, Inc., Boston engineering firm, acts as consultant to the city in design and construction of the project. E. C. Brantly is manager of the Electrical Department, and R. A. Moncrieff is resident member of

(Continued on page 66)

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High lift and long reach cut excavating costs with Koehring Shovels. . . . The Koehring independent and positive crowding action spots the dipper beyond and above the end of the boom or wherever it may be desired. . . . This 5/8 yard Koehring Shovel is operating in a brick plant where high lift and long reach are essential for maximum production.

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(Continued from page 64)

the consulting firm at Danville. PWA is represented by J.R.A. Hobson, Jr., project engineer.

At the site, 86 mi. by road from Danville, operations were directed for the Electrical Department by D. J. Shea, resident engineer; C. H. Hylton, assistant resident engineer, and J. J. Downey, field engineer.

Representing the contractors, J. S. Williams was general superintendent for Ligon & Ligon, and Dewey T. Hogue was superintendent in charge of construction on the two dams for Ligon & Ligon and the Sammons-Robertson Co., Inc.

AUTOMOTIVE HAULAGE

(Continued from page 55)

ple, knowing the actual yardage moved, by means of instrument survey, and the corresponding number of loads hauled, simple division determines average payload. When there is no chance for fixing payload by trial, as when considering the purchase of an untried hauling unit, the estimator must calculate.

Capacity Rating — Unfortunately, manufacturers do not rate capacities uniformly. Truck builders usually rate in terms of water-level capacity, but road machinery builders generally rate in terms of sloped capacity. Either method is satisfactory, provided all dimensions of the body are given to permit the specification reader to figure for himself. Sometimes the specifications do not contain pertinent dimensional data, and the reader is in a quandary. Lacking complete dimensions, it is best that water-level capacity be given.

On the basis of his own observations and experience, the writer believes that the average slope of the loose load in a unit varies between 2:1 and 3:1. In a unit of average body proportions, this is equivalent to saying that the average loose load is about one-sixth greater than the water-level capacity of the unit. In doubtful cases, an estimator should compute the average loose load based upon a 2½:1 slope or upon some selected practical slope.

Swell Factor — Having determined the average load, loose measurement, one must shrink this value to equivalent bank measurement, if this measure is the basis of unit cost or payment. The amount of shrinkage depends upon the nature of the material and upon the amount of swell from bank to loose measurement. Commonly accepted swell factors for various materials are given in an accompanying table.

The average load, bank measurement, is easily estimated from the foregoing rule and the table of swell factors. For example, a 10-yd. water-level-capacity unit of average body proportions will haul about 9.3 cu.yd., bank measurement, of common earth. Solution is expressed by the following: Cubic yards, bank measurement, equals

$$\frac{10.0 \times 1\ 1/6}{1.25} \text{ equals } 9.3 \text{ cu.yd.}$$

Shrinkage Factor — If the basis of payment is for material in place in the finished earthwork, another computation is involved. A factor is neces-

(Continued on page 68)

FITS YOUR JOBS

Giant scrapers fit ONLY jobs where conditions include: (1) room for them to work, and (2) soil permitting them to heap the load, and (3) yardage justifying a large equipment investment, and (4) suitable division of the job for large scraper operation.

Bucyrus-Erie scrapers fit ANY scraper-type job because: (1) they are small and easily maneuvered anywhere (2) they heap loads in any kind of scraper material . . . loam, sand, gravel, clay, gumbo, rooty material, or even in dirt with light rock seams . . . (3) they require only a small capital investment . . . usually pay this off in profits on only a few months operation; (4) they can be used singly or in multiple units to fit requirements of any sized job or any section of it . . . they fit the problems of digging in, "hogging in" the dirt, or cleaning up at the end.

Find out how these handy high-speed units fit into your picture . . . call your International Industrial Tractor dealer for facts and figures.

Bucyrus · Erie

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

(Continued from page 66)

sary for converting either bank or loose measure to place measure. Just as the selection of a swell factor is a matter of judgment, so the selection of a shrinkage factor calls for experience. Trautwine suggests shrinkage factors given in an accompanying table for materials from bank or cut to settled fill. Trautwine also suggests that 1 cu.yd. of rock in bank or cut will make from 1⅔ to 1¾ cu.yd. of embankment, say an average of 1.7.

Computing Payload — On a typical levee building job along the Mississippi River, the hauling units are rated at 10 cu.yd., 2:1 slope measurement, and 8.4 cu.yd., water-level measurement. The levee material is a mixture of loam and sand, and the U. S. Engineer Office provides an allowance of 15 per cent of the net fill for shrinkage. In this case two shrinkage factors are involved, the first one being from original bank to placement in the levee and the second being from placement to pay measurement. An estimate of the payload on the basis of final payment is derived as follows:

Average loose load in hauling unit	10.0 cu.yd.
Average load, bank or borrow-pit measurement, assuming swell factor of 17 per cent for loam and sand mixture	8.5 cu.yd.
Average load, levee measurement before final fill settlement, assuming shrinkage factor of 10 per cent for loam and sand mixture	7.7 cu.yd.
Average load, basis of final payment for net fill after allowance of 15 per cent for shrinkage	6.7 cu.yd.

This computation makes it obvious that the unit is hauling a payload equivalent to about two-thirds of its rated capacity.

Estimating Payload — As a recapitulation of what has been said on the subject of payload, it may be well to summarize here the points which require consideration in estimating payload.

(1) Manufacturer's ratings for hauling equipment, whether ambiguous or not, should be carefully checked to eliminate any excuse for large error in the estimate of loose load in cubic yards or in tons.

(2) Material to be hauled should be carefully investigated to avoid large errors in swell or shrinkage factors. Recently the writer estimated that a 10-yd. water-level-measurement unit would haul an average payload of 8.8 cu.yd., on the assumption that a loose load of 11 yd. of a mixture of gravel, sand, and clay would swell about 25 per cent from bank to hauling unit. The actual load, determined by careful instrument cross-sectioning of the borrow pit and load count, was 7.6 cu.yd. This discrepancy was the result of an unforeseen swelling effect of the clay content, which caused about 45 per cent swell factor.

(3) Hauling units should be carefully checked for construction and engine power to assure comfortable handling of the estimated payload.

Unit Cost — Errors in estimating hauling cycle, payload, and hourly expenses are generally accumulative, because a man who underestimates round-trip time is likely to overestimate payload and underestimate expenses. The results are vicious. If the optimistic estimator decides to assume an average travel speed of 15 m.p.h. instead of the precise 7½ m.p.h., hauling cycle will be reduced by about 27 per cent and loads per working hour will be increased by 37 per cent. If he decides that the average slope of material in the body of the unit will be 1½:1 instead of the reasonable 3:1, payload will be increased by about 10 per cent. If he decides that tire and tube costs allow-

(Continued on page 70)

Making It Safe for Traffic...

Here's one ice-covered road that is being rapidly and thoroughly treated with a Galion highway sander. This small, economical unit can be quickly attached to truck and material can be spread over *two lanes in one trip.*

The Galion highway sander spreads sand, rock salt, slag, slack, cinders, Calcium Chloride, etc., in a remarkably short time . . . roads are made safe for traffic and are safeguarded against the hazards of ice and sleet.

It is easy to operate, positive in action, and spreads with truck moving forward or backward. Feed valve regulates amount of material being spread as well as its distribution. Let us send you full details about the Galion highway sander.

•

Motor patrol graders
Pull type graders
Road rollers
Spreaders
Maintainers
Scrapers • Drags

•

THE GALION IRON WORKS & MFG. CO.

Main Office & Works: **GALION, OHIO** ***Export Division:*** **COLUMBUS, OHIO**

(Continued from page 68)

ances are too high because the units are new, he may underestimate his expenses by 5 per cent.

When all these errors are accumulated, it is found that unit cost has been underestimated about 37 per cent. Sometimes the reverse is true, and the estimator is too conservative. Unfortunately, the conservative estimators do not appear to be so much in evidence as those who grind their axes in the sharp competition of low "paper" costs. There is but one logical training for estimating — detailed and painstaking studies of time, volume, weight, and machinery characteristics and costs in the field.

BACKDIGGER *Excavates House Basement*

(Continued from page 56)

the basement was dug in an open field with no restrictions on any side. The diagram shows the order in which sections were removed and the direction of travel of the backdigger in each case.

Sewer Trench—As the first step, the backdigger excavated the sewer trench, starting at the back line of the lot, where the main sewer was uncovered and the tap located at a depth of about 6 ft. Starting at this point, 60 lin. ft. of sewer trench was dug to the rear basement line. The floor of the trench was graded on a slope from 6-ft. depth at the tap to 5-ft. depth at the basement line.

Trench digging was completed in 30 min. working time. Laying of sewer tile followed closely on the heels of the trench execavation.

Four Digging Sections—When the basement line was reached, the backdigger took out Sec. A, the easterly portion of the north wall, which was excavated by making a single cut, 44 in. wide, equivalent to the width of the backdigger dipper. This section, about 20 ft. long, was taken out in 5 min. working time.

On reaching the northwest corner, the backdigger turned to face north and lined up the west edge of the dipper with the west digging line. The machine dug toward the south, moving in this direction as necessary, and removed a wedge-shaped section (B) in a working time of 25 min.

Upon reaching the southwest corner, the backdigger turned again, facing west, and lined up the south edge of the dipper with the south digging wall. The excavator proceeded to dig in a westerly direction and removed Sec. C in 15 min.

At the southeast corner, the unit again turned, traveling from this point in a northerly direction and taking out the east wall and Sec. D in 30 min. working time.

Total time required to dig the basement was:

Digging	sewer	. . .	30 min.
Digging	Sec. A	. . .	5 "
Digging	Sec. B	. . .	25 "
Digging	Sec. C	. . .	15 "
Digging	Sec. D	. . .	30 "
	Total		105 min. = 1 hr. 45 min.

Hand Work—Although the digging time was short, the backdigger handled the job in such a

(Continued on page 72)

Modern Magic ...CHANGES A RIVER'S COURSE

Read this dramatic story of the part played by Shell Lubricants in the construction of the Ralston Dam

MODERN INDUSTRIAL MAGIC—that's what it takes to lead water from the west side of the Continental Divide . . . water destined by nature for the Pacific Ocean . . . through the mountains, to be stored behind the big new Ralston Creek Dam and piped into Denver, thirty miles to the east.

Shell Industrial Products played an important role in Denver's latest search for water. In the building of the big Ralston Creek earth dam and reservoir, the United Construction Company of Winona, Minnesota, used Super-Shell Gasoline, Shell "DIESELINE" and Shell Industrial Lubricants.

Their four big Diesel-powered shovels, their twenty-seven huge doughnut-tired trucks, their concrete mixers, pumps and air compressors—all operated exclusively on Shell products!

The part played by these Shell Industrial Lubricants in the building of this great project tells more than all the sales talks in the world. For construction men from coast to coast, on big jobs and small, are discovering that Shell Industrial Lubricants applied by Shell engineers . . . *pay off in results.*

Shell gives you a "plus" in lubricating values: A combination of the finest products being refined today . . . a top-notch engineering staff . . . the resourcefulness born of long and varied experience with *your* problems.

• • •

This "plus" in lubrication is always ready to cope with your toughest problems. Simply write or telephone your nearest Shell office.

SHELL *CONSTRUCTION* **LUBRICANTS**

SHELL

(Continued from page 70)

manner that the basement was virtually completely finished when it stopped digging. Corners, walls and floor grade required only a minimum of hand trim. One groundman working with the backdigger was able to lay the sewer tile and to keep right on the heels of the backdigger in finishing up the grade.

Backdigger Dipper — Basement excavation on this job was handled with a full ¾-yd. dipper, 44 in. wide, outside to outside, equipped with a special rounded heel to prevent dragging in cutting corners and vertical walls. The dipper was wide and short to facilitate fast filling and dumping, without danger of materials packing in the dipper. It was fastened to the dipper stick with a high cast-steel arch to aid rapid dumping.

Contractor's Job Record—Mr. DiPonio keeps two backdiggers busy on this type of work. He reports that his first backdigger dug a total of 500 basements between September 20, 1937, and August 20, 1938, a period of 11 months. This period includes the worst digging conditions of the year, both in weather and ground conditions, yet shows an average of about two basements dug per working day.

To handle this volume of work, which is scatterd all over Detroit, the backdigger moves quickly from job to job on a twelve-wheel pneumatic-tired single-purpose trailer which can be loaded or unloaded in 10 to 15 min. The trailer is towed by a Ford truck which between moves acts as a service car to bring fuel and supplies to the backdigger.

Advantages—One of the great advantages of the backdigger method of excavating basements is the reduction in hand work and time to minimum. Another advantage is that the backdigger remains on firm ground, free of wet bottom and planking difficulties. The method eliminates digging and backfilling of ramps. Spoil can be piled wherever desired, leaving one or two sides open for delivery of materials and convenience of workmen.

Employer's Responsibility

FOLLOWING a blast of dynamite a workman taking refuge on a barge was struck by a flying rock and killed. The employing company contended the fatality was due to negligence as employees had been warned to go to a safe refuge but had remained in a dangerous place contrary to instructions.

The Court found no one having authority was in charge of the six men on the barge. He awarded judgment to the parents of the young man, saying: "It has frequently been held that it is not sufficient for an employer to issue general instructions to his employees; he must take necessary steps to see that those instructions are carried out."—NATIONAL SAFETY COUNCIL.

HEIL DIG-N-CARRY SCRAPER

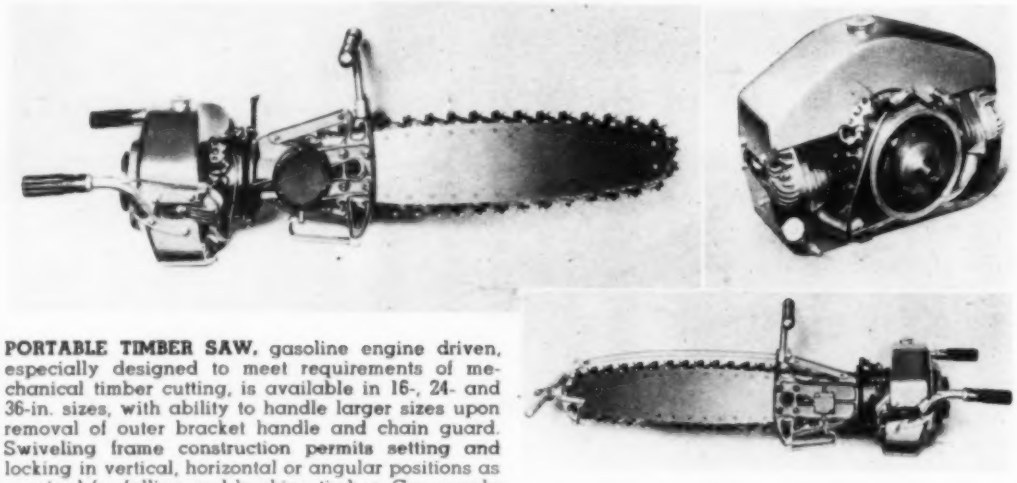
On job after job where scraper performance is judged by hard-boiled, competitive standards, Heil Hydraulic Dig-N-Carry scrapers have "come through" with flying colors — Every Heil Hydraulic scraper, from the smallest (6 cu. yd. capacity) to the largest (15-16 cu. yd. capacity), has unusual features of design that insure PROFITABLE operation in any kind of soil, rain or shine — By all means write, wire or phone for Heil recommendations before you buy!

CONSTRUCTION EQUIPMENT NEWS

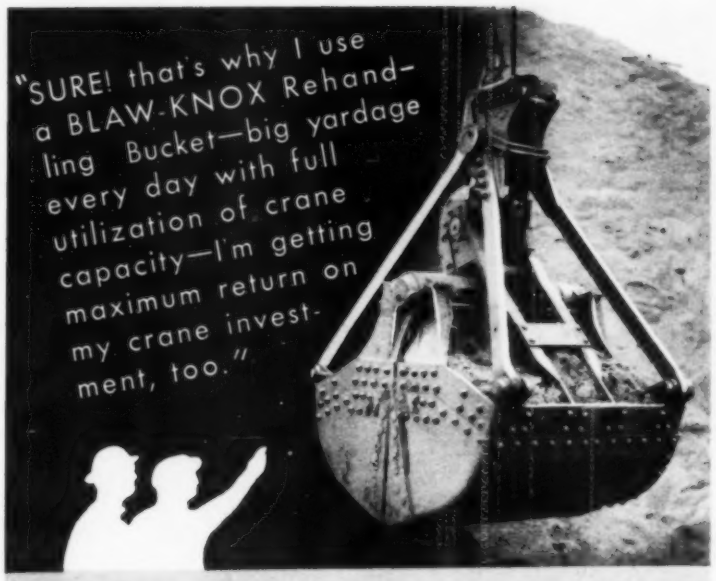
Review of Construction Machinery and Materials for JANUARY, 1939

POWERFUL NEW HAULAGE UNIT, known as the "Tournapull," operates Carryall scraper of 22½-cu. yd. struck capacity (30-cu.yd. heaped measure) and is equipped with 160-hp., V-8 type Caterpillar diesel engine mounted on two heavy angle steel beams which connect directly to transmission case built up of cellular welded steel plate to serve as supporting element. Six speeds forward and two in

reverse. Top speed is 18 mi. per hour, empty, and almost 17 mi. per hour loaded with 40 tons of earth. Huge 32-ply pneumatic tires designed especially for this two-wheel unit measure 24 in. across and 80 in. in diameter and carry air at from 55 to 60 lb. pressure. Steering is done by independent control, governed by cone clutch, on each wheel. Rim pull ranges from 38,800 lb. in first gear to 3,000 lb. in sixth gear. With power applied to each wheel independently outfit can zigzag its way out, if mired. Twelve of these outfits have been ordered by Guy F. Atkinson Co., for work on Hansen dam in California. In addition to large unit above described, manufacturer plans two smaller sizes of Tournapulls, the smallest being 12 cu.yd. — **R. G. Le Tourneau, Inc., Peoria, Ill.**



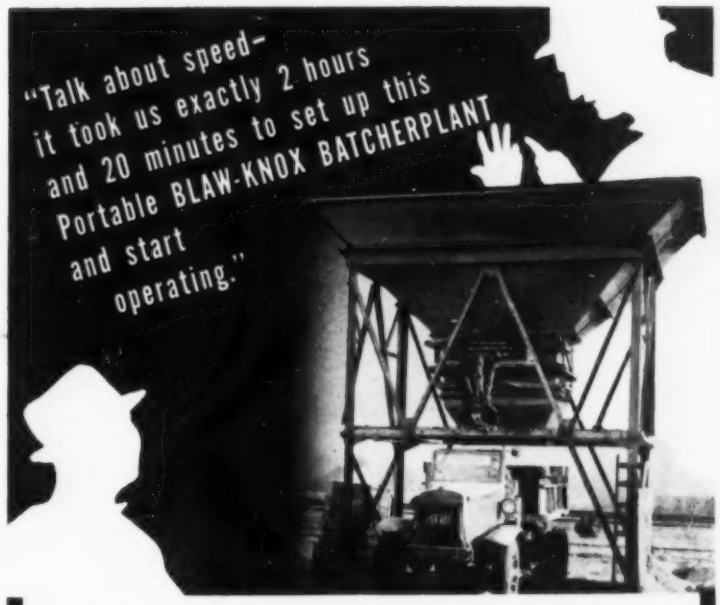
PORTABLE TIMBER SAW, gasoline engine driven, especially designed to meet requirements of mechanical timber cutting, is available in 16-, 24- and 36-in. sizes, with ability to handle larger sizes upon removal of outer bracket handle and chain guard. Swiveling frame construction permits setting and locking in vertical, horizontal or angular positions as required for falling and bucking timber. Gas supply and stopping of engine controlled from handle. Grease gun is attached to frame for oiling chain. Typical cutting performance: average cutting capacity up to 24-in.-diameter pine, 1 in. per second; bucking cut rock maple, 30 sec.; pine, 40-in. diameter, undercut and felled in 7 min. with 24-in. saw from which outer bracket, handle and chain guard had been removed. Gasoline engine is two cylinder horizontal opposed, 4-cycle, air-cooled unit which develops 5 hp. at 2,800 r.p.m. and which may be used with other portable units. Saw chain, frame and drive units interchangeable with a.c. electric and air driven machines. Weights, 75, 80 and 90 lb. — **Reed-Prentice Corp., Worcester, Mass.**



Bulletin 1606 entitled Blaw-Knox Buckets for Contractors shows how to select a bucket to secure the profitable difference between peak and ordinary performance—it will be sent on request.

BLAW-KNOX DIVISION of Blaw-Knox Company
FARMER'S BANK BUILDING PITTSBURGH, PA.

BLAW-KNOX
REHANDLING BUCKETS



Quick erection, dismantling, moving and re-erection make the Blaw-Knox Portable BATCHERPLANT a desirable unit on any construction job.

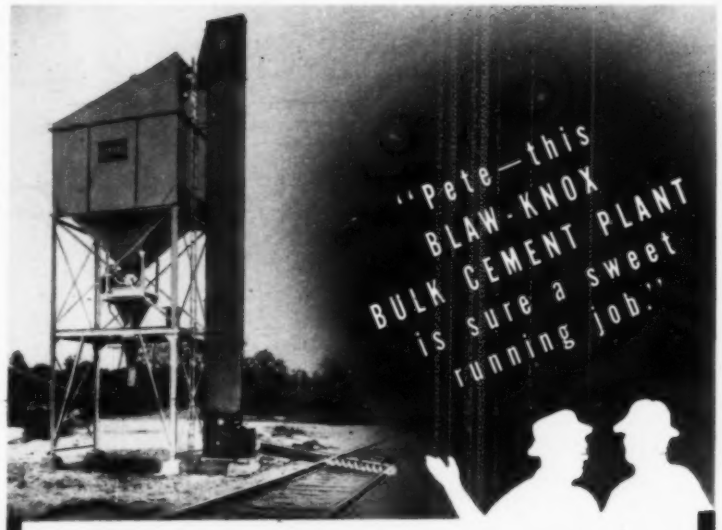
Shipped complete with batching equipment attached—Blaw-Knox Batcherplants are made in a complete range of types and sizes, suitable for your work.

For complete details—send for a copy of catalog No. 1566.

BLAW-KNOX DIVISION of Blaw-Knox Company
FARMER'S BANK BUILDING PITTSBURGH, PENNA.

5

BLAW-KNOX
Portable BATCHERPLANTS

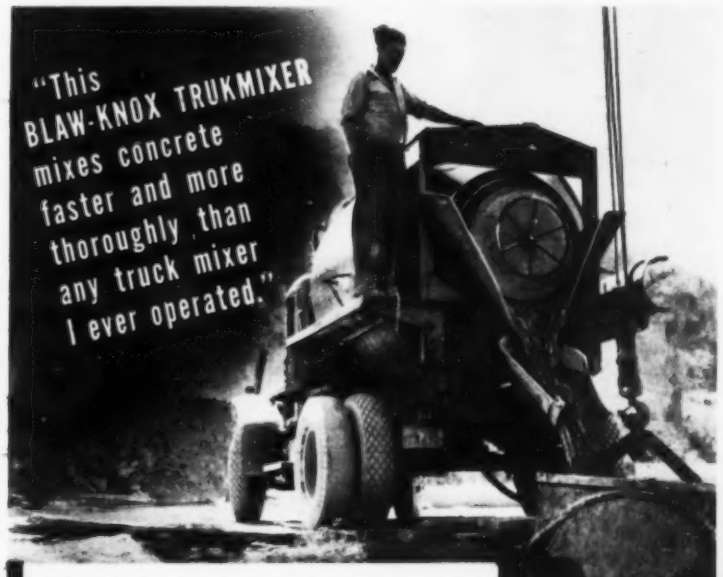


- Blaw-Knox BULK CEMENT PLANTS are the ultimate in portability, speed, and convenience of use and operation. They are *complete units* for unloading, storage, batching and handling of bulk cement—dependable and accurate.

Completely described in Blaw-Knox Catalog No. 1566. Send for a copy.

BLAW-KNOX DIVISION of Blaw-Knox Company
FARMER'S BANK BUILDING PITTSBURGH, PENNA.
Offices and Representatives in Principal Cities

BLAW-KNOX
BULK CEMENT PLANTS



Users look at the details of construction and performance—then buy Blaw-Knox TRUKMIXERS.

The desirable and popular features of Blaw-Knox Trukmixers and Agitators are completely illustrated and described in Catalog No. 1582. Send for your copy.

BLAW-KNOX DIVISION of Blaw-Knox Company
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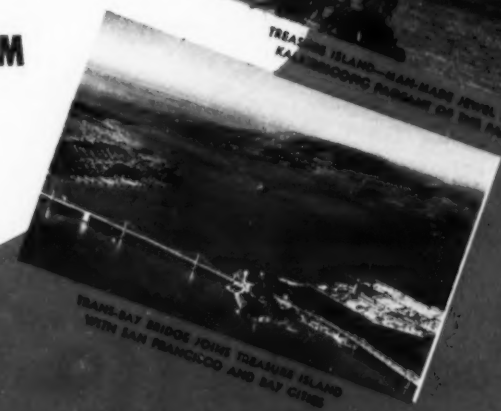
BLAW-KNOX
TRUKMIXERS *and Agitators*

"HIGHWAYS OF TOMORROW"



WHAT WILL THEY BE LIKE? HOW WILL THEY BE BUILT?

THE 36TH ANNUAL CONVENTION AND HIGHWAY EXHIBIT

of the

AMERICAN ROAD BUILDERS' ASSOCIATION

Presents

A WESTERN PREVIEW
TO INFORM YOU ABOUT

MODERN METHODS- MATERIALS-MACHINES

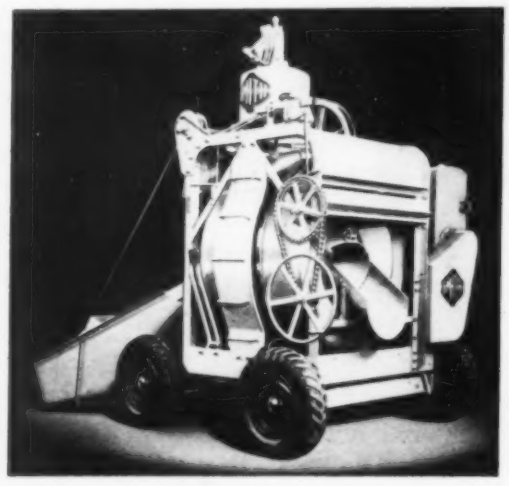
The Place SAN FRANCISCO'S CIVIC AUDITORIUM

The Time MARCH 7-8-9-10, 1939

SPECIAL TRAIN AND PLANE RATES TO SAN FRANCISCO WILL BE IN EFFECT.

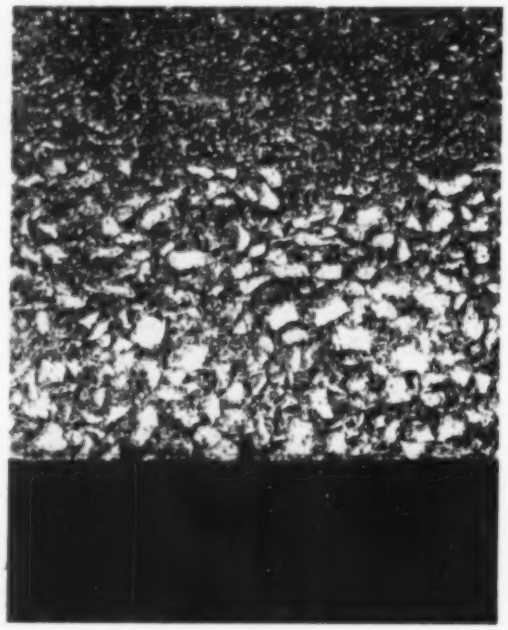
MAIL YOUR HOTEL RESERVATIONS TODAY TO ARBA HOUSING COMMITTEE—EXPOSITION AUDITORIUM —CIVIC CENTER—SAN FRANCISCO.

NON-TILT MIXER (14-S) in four-wheel end- or side-discharge models is said to incorporate special features designed to speed up three phases of batch cycle, loading, mixing and discharging. "End-to-center" mixing action permits ten full-width buckets to work batch continually from ends to center.



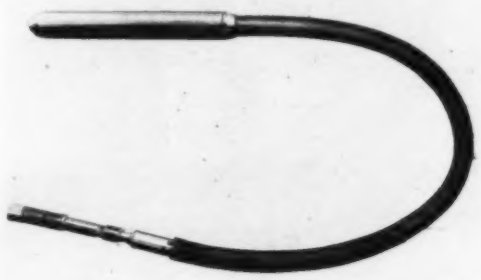
Drum is unusually narrow with extra large diameter and wider drum openings. Machine is of sturdy all-steel construction, compact and lightweight. Features include: Single center gear ring and roller tracks, drum rollers turning on dustpoof ball bearings, inclosed gear reduction, multiple V-belt drive, outside band clutch and skip brake, oversize streamline skip equipped with automatic skip vibrator, accurate siphon-type water tank, auto-type steering, spring mounted axles, anti-friction bearings throughout. — **The T. L. Smith Co., Milwaukee, Wis.**

CORK AND RUBBER FLOORING MATERIAL, called "Monocork," plastic, non-slip, water resistant, may be used as subfloor between steel deck and linoleum and rubber tile floor coverings and as a surface floor covering. Composed of rubber latex, dehydrated powder, granulated cork and various types of fillers. Principle of setting of this composition is



based on fact that latex sets by loss of water, while dehydrating agent sets by absorption of water. Ingredients of Monocork shipped to job in three containers: one for rubber latex paste; one for powder containing dehydrating agents and all mineral fillers, and one for cork filler. When combined in mechanical mixer on job result is plastic mixture which is troweled over sub-base like cement or plaster. Advantages: (1) Provides monolithic surface; (2) light-weight, non-slipping, either wet or dry; (3) flexible enough to withstand considerable distortion before cracking or breaking; (4) resilient underfoot, quiet under traffic and resistant to wear. Adheres to clean steel, concrete, masonry, composition boards or wood surfaces. Natural color of product is dark gray or black, but it may be pigmented to obtain darker colors or one as light as battleship gray. — **Armstrong Cork Co., Lancaster, Pa.**

SHIMMY SPADE. small-diameter (2½-in.) light-weight vibrator for fast economical use in thin walls, floors and roof slabs, columns and pile casting where concrete is not under 3-in. slump. Can also be attached to outside of pipe and other pre-cast product molds



and tables. Capacity, 15-20 cu.yd. per hour; weight, 30 lb.; air consumption, under 35 c.f.m.; recommended operating pressure, 90-100 lb. Vibrating tube diameter 2½ in.; length 19 in. Standard equipment: 5-ft. exhaust hose; 15-ft. auxiliary hose for operation in deep forms; line oiler; line strainer and twist throttle which can be located at end of exhaust or auxiliary hoses (20 ft. from tube) to suit placing conditions. — **Chicago Pneumatic Tool Co., 9 E. 44th St., New York City.**

TRACTOR SNOW SWEEPER made for use with nearly all types of industrial wheeled tractors is said to clean snow from sidewalks, driveways, city streets and parkways with ease and simplicity. Because of

facility of attachment to any wheeled tractor, light weight, low cost and flexibility of operation, these units are particularly useful in parks, cemeteries, skating rinks, large industrial plants and other places where an inexpensive unit is required. One- and "tu-way" models, the latter similar in design to the first, but featuring a two-direction brush that will sweep either to left or right with instant change of direction. — **The Frank G. Hough Co., 919 N. Michigan Ave., Chicago, Ill.**

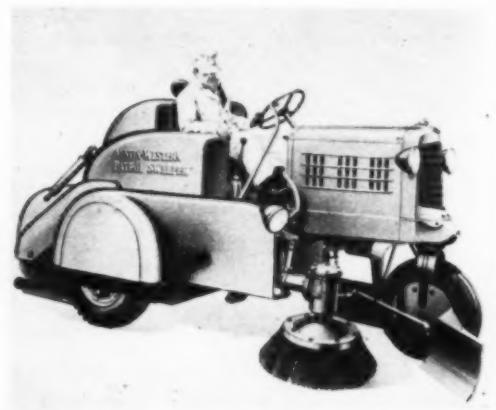
10-IN. TILTING ARBOR CIRCULAR SAW is completely self-contained machine, motor and driving mechanism being inclosed in modern cabinet into which most of sawdust is discharged. Saw table, without side extension wings, is 20x27 in. and will handle work up to 24 in. wide and 3⅛ in. thick. With side wings table is 27x36 in. Ripping extension

bars, front and rear, are standard built-in part of machine. Saw blade tilts 45 deg. to right, operation being effected by large handwheel to left of machine. Blade raised and lowered by similar hand wheel in front of cabinet. Saw arbor carried on "sealed-for-life" ball bearings which require no lubrication. Saw is fitted with double-face, double-lock grip gage extending from front to rear of table which permits ripping to center of 48-in. panel. Also equipped with "Auto-Set" miter gage with individually adjustable stops for 90-, 45- and 135-deg. positions so that no time is lost in setting gage. Powered by motors from ½ to 1½ hp., as desired. — **Delta Mfg., 600 E. Vienna Ave., Milwaukee, Wis.**

TRUCK-MIXER consisting of 1½-cu.yd. Rex Moto-Mixer mounted on new model EF Mack light-capacity truck is used by Edward Ball Co., of Hartford, Conn., to deliver concrete which is mixed en route to building sites. Truck is said to be built to carry its full rated capacity of 14,000 lb. without strain and

under severest operating conditions. Powered by 271-cu.in. motor. Features: Chrome-nickel cylinder block; drop-forged, counterbalanced crankshaft with seven main bearings; directed water circulation to exhaust valves; timing drive by gears; exhaust valve seat inserts; packingless water pump; vaporizer with seasonal adjustment. Drive is through rugged, four-speed transmission with case hardened, heat-treated gears. Four-wheel hydraulic brakes. Deluxe cab. **—Mack International Motor Truck Corp., 34th St. and 48th Ave., Long Island City, N. Y.**

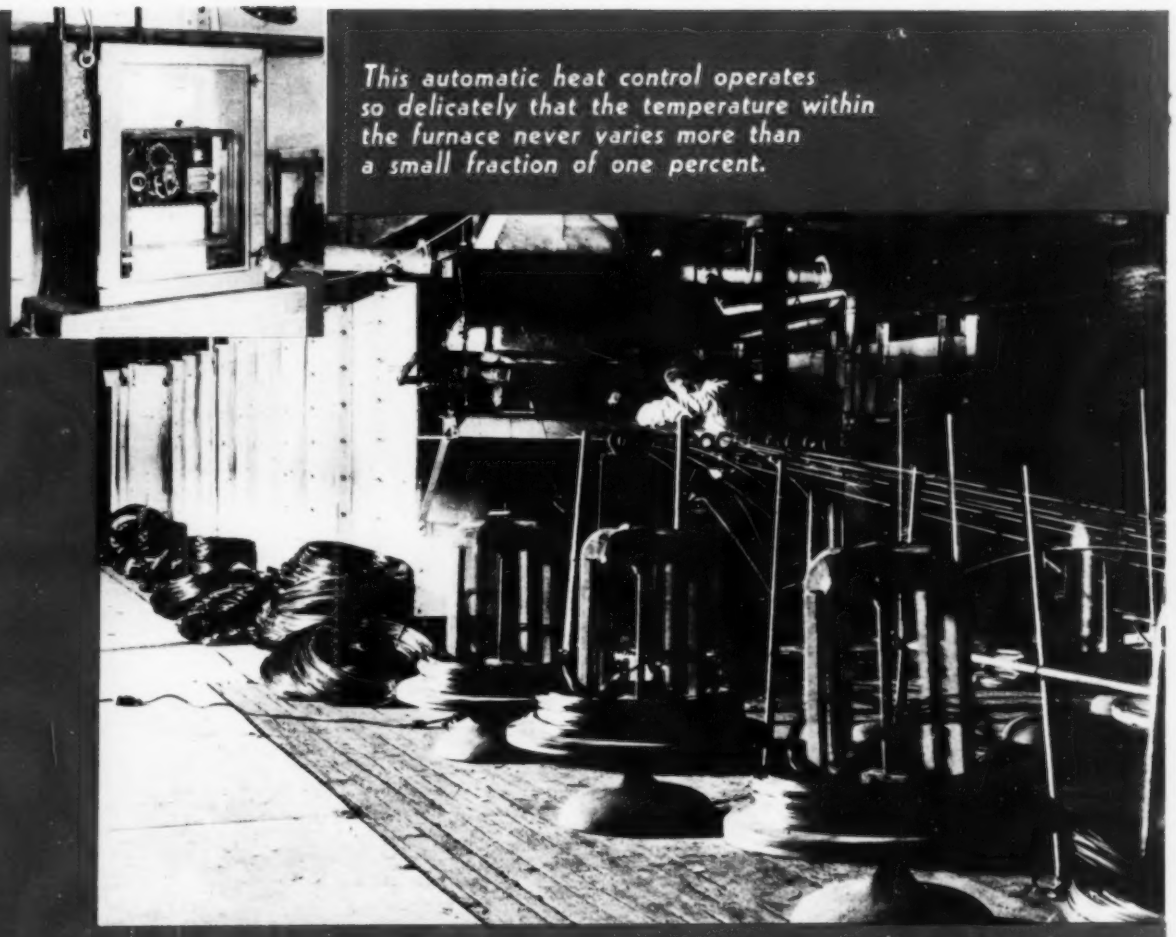
SMALL, SIMPLIFIED SWEEPER that cleans 5½ ft. of pavement at single pass was built primarily to clean gutter area where dirt usually collects. Equipped with two revolving brooms which are said to pick up litter, cinders, broken glass and even bricks at



all seasons. Powered with four-cylinder, 29-hp. motor for operations on steep grades as well as level pavements. To lay dust and penetrate crusted dirt, a pump-driven spray is used. To scour pavement near curb where dirt is thickest, there is provided a "bump-proof," fast revolving steel broom which flares out to 32 in. A tough fibre broom measuring 36 in. in diameter is used to pick up litter and throws it into 1-cu.yd. trash box, which is dumped by operator by means of hydraulically controlled lever. **— Austin-Western Road Machinery Co., Aurora, Ill.**

RUBBER VIBRATION DAMPENERS for application to electrically driven comptometers and accounting machines used by business houses and industrial concerns. Vibration caused by such machines in action frequently is transmitted to other parts of build-

ing, causing annoyance to workers. Application of vibration dampeners between feet of machines and floor eliminates vibration and reduces mechanical operation noises. Use of dampeners also prolongs life of machines by absorbing shocks. Installation requires no alteration of machines or change of their location. — **The Goodyear Tire & Rubber Co., Akron, Ohio.**



This automatic heat control operates so delicately that the temperature within the furnace never varies more than a small fraction of one percent.

YOUR ROPE COSTS ARE DETERMINED IN OUR PATENTING FURNACE

BUILDING LIFE INTO WICKWIRE ROPE "BEYOND SPECIFICATIONS" . . . .

To fully appreciate the importance of control in heat treatment of rope wire, the user of rope must consider the value to him of consistent rope performance. In the patenting furnace are built the structures that give a rope long life, freedom from fatigue, and uniformity. Variations in temperature materially change these characteristics. Therefore Wickwire Spencer has spared no expense in determining what the proper temperatures should be and in equipping their furnaces with automatic controls that eliminate the unreliability of hand operation.

WICKWIRE ROPE

It is still the privilege of the progressive manufacturer to build rope life into his product beyond official specifications.

WICKWIRE SPENCER STEEL COMPANY

General Offices: 41 East 42nd Street, New York City; Sales Offices and Warehouses: Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles, Tulsa, Chattanooga, Houston, Abilene, Texas, Portland, Seattle. Export Sales Department: New York City

NEWS FROM MANUFACTURERS *About Their Products*

The publications reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use.

SAFETY CLOTHING AND EQUIPMENT — **American Optical Co.**, Southbridge, Mass. (28 pp., illustrated.) Complete line of protective clothing, gloves, sleevelets, leggings, aprons, hats, hoods and other equipment. These products are available in a variety of materials to protect workmen from heat, fire, acids, cuts, abrasions, etc. Materials used are designed to give maximum comfort in addition to protection under specific conditions. Among products are steel-stapled gloves and mittens for handling brick, steel sheets, rail, wire and other materials; safety-service gloves; electricians' rubber gloves; paint sprayers' helmets; "hard-boiled" hats molded from micarta; non-slip cork-grip shoes for ladders.

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ROADSIDE CRUSHERS—**Iowa Manufacturing Co.**, Cedar Rapids, Ia. (8pp., illustrated.) Bulletin RC-2 illustrates and describes latest type and models of tractor-operated portable crusher units which make possible utilization for surfacing of materials found along roadside. Mountings include two-wheel trailer chassis, four-wheel truck for larger sizes and self-propelled push-type tractor-crusher unit on pneumatic tires. Accessory equipment includes belt conveyor and power-driven skip for feeding crusher. Table gives rated capacities, in tons per hour, for crushers of various sizes, with openings ranging form 9x12 to 9x36 in.

• • •

ENDLESS BELT — **Raybestos-Manhattan, Inc.**, The Manhattan Rubber Mfg. Division, Passaic, N. J. Bulletin describes construction and applications of Condor Whipcord Endless belt which is available in six styles and which features a patented extensible tip splice in the outer cover with rubber rivets to prevent separation at the seam. Also are included instructions for determining the proper length of belt and a horsepower rating table.

• • •

TAR AND ASPHALT KETTLES — **White Manufacturing Co.**, Elkhart, Ind. (4-pp. illustrated folder.) Fireproof design is feature of tar-heating kettles on which models of 165-gal. capacity or more have two burners. Kerosene tanks and burners are detachable. Asphalt kettles, in 220- and 300-gal. capacities, with fireproof tops, are mounted on two-wheel, pneumatic-tired trailers. Equipped for spraying patches and penetration repair work.

• • •

REPAIR CLAMPS FOR PIPE — **M. B. Skinner Co.**, South Bend, Ind. (32 pp., illustrated.) Nine different styles of pipe repair clamps for stopping leaks in cast-iron pipe without replacing pipe. Also saddles, valve and bibb reseaters. Leak-loss chart shows how much steam, water, oil or air escapes from various size leaks in pipe under different pressures.

• • •

FLUTED PILES—**Union Metal Manufacturing Co.**, Canton, Ohio. (22 pp., illustrated.) Describes design of Monotube cast-in-place tapered, fluted concrete piles and method of installation. Fluting of steel casing adds to surface area of pile, giving greater skin frictional area, and increases rigidity during driving without mandrel. Photographs illustrate applications to many types of foundation structure. Complete specifications for cast-in-place concrete piling.

NEW 1939
CHEVROLET TRUCKS

MASSIVE NEW SUPREMLINE TRUCK STYLING . . . COUPE-TYPE CABS . . . VASTLY IMPROVED VISIBILITY

giving a much handsomer, sturdier appearance—more seating room—and much greater driver comfort, as well as greater driving safety.

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FAMOUS VALVE-IN-HEAD TRUCK ENGINE

with even greater economy-leadership and with the maximum pulling power for which Chevrolet trucks have always been famous.

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POWERFUL HYDRAULIC TRUCK BRAKES

of the special Chevrolet double-articulating, controlled self-energizing design—the safest and most dependable brakes built today.

(Vacuum-Power Brake Equipment optional at additional cost.)

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FULL-FLOATING REAR AXLE

extra strong—extra rugged—extra dependable . . . available on Heavy-Duty models only.

(2-Speed Axle optional at additional cost.)

Higher Quality—Lower Prices

45 different models

in eight wheelbase lengths

Your business is different, of course. It is for just that reason that you will be especially interested in what Chevrolet has done to provide motor trucks exactly fitted to your particular needs. There is hardly any business for which there are not appropriate trucks to be found among the Chevrolet models for 1939—the most complete and most capable line of trucks Chevrolet has ever offered.

Chevrolet now offers you a choice of 45 different models, in eight different wheelbase lengths, and all Chevrolet-built through and through—chassis, engines, cabs and bodies. Capacities cover the full range from that of the fleet Sedan Delivery to the new Cab-Over-Engine Heavy Duty models with a range of gross weight ratings to a maximum of 14,000 pounds. And all these models sell in the lowest price range.

Every desirable feature of advanced engineering is to be found in these new trucks. They are the great power-pullers of their price class—the most economical trucks to be had. New lower prices make them the outstanding values of the year.

CHEVROLET MOTOR DIVISION, *General Motors Sales Corporation*, DETROIT, MICHIGAN

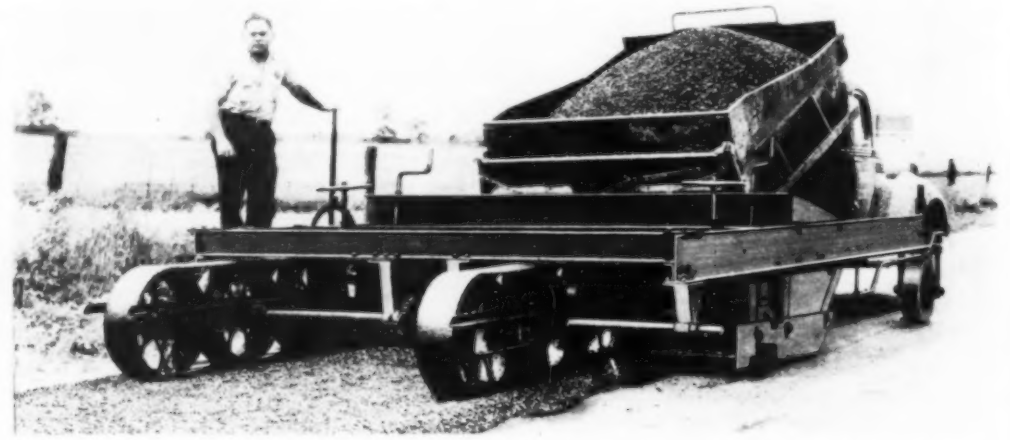
General Motors Instalment Plan—convenient, economical monthly payments. A General Motors Value

"DESIGNED FOR THE LOAD CHEVROLET TRUCKS *POWERED FOR THE PULL"*

HEAVY-DUTY FULL-REVOLVING TRUCK SHOVEL-CRANE, ¾-yd., 16-ton capacity, for use with truck having gross rating of 50,000 lb. equipped as six-wheeler with dual drive, is said to provide wider working ranges and safer crane loads on truck-mounted units. Upper revolving turntable and roller path of large diameter with internal ring gear are of unit cast nickel manganese steel, reducing unnec-

essary dead weight but retaining all advantages of one-piece castings to absorb shock and vibration and to give stability. Use of anti-friction bearings on all machinery shafts and in boom sheaves reduces power loss and assures maximum developed horsepower. External contracting band-type clutches and brakes provide for easy adjustment and lining replacement. "E-Z" control booster-operated hoist and auxiliary hoists reduce operator fatigue. Other features: (1) Positive patented swing lock; (2) patented electric dipper trip and self-locking boom hoists. Machine has swing speed of 5 r.p.m. and is equipped with lattice-type structural steel 30-ft. boom. Alloy steel booms with removable sections up to 80 ft. for high reach are available.—**Bay City Shovels, Inc., Bay City, Mich.**

SPREADER AND FINISHING MACHINE for use in new construction as well as resurfacing is said to provide unusual economy in operation because of its ability to spread or lay materials faster and to handle all types of material, such as hot or cold mixes, macadam or stone. Used with rear-dump trucks, spreader can serve a fleet of haulage units on one job. Rear drive or tread runs on newly



laid surface, eliminating possibility of reproducing old depressions, ruts or holes. Finishing of center-line joint accomplished without manual labor. Leveling adjuster enables machine to lay material to any desired thickness. Important feature of new machine is screed with oscillating movement furnished by connecting rod powered off six rear wheels which controls at all times smoothness of finished surface and keeps it always on flat horizontal plane. Screed speed may be varied to suit all classes of material and tilted to suit desired crown of road or pavement.—**The Shunk Mfg. Co., Bucyrus, Ohio.**

HIGH-SPEED EXCAVATOR known as Koehring 603 has as outstanding features inclosed gears, anti-friction bearings and selective swing speeds. Fully convertible for dragline, crane and trench-hoe as well as for pile-driving operations without difficult shaft or drum removal. For shovel use a 1½-yd. abrasion-resisting steel dipper is furnished, and for dragline or crane work a 1¾-yd. bucket is used. Crane operates efficiently with magnet arrangement, piledriver leads or with block and hook. Other features: (1) High-strength cast-steel oil-tight gear cases; (2) self-cleaning crawlers free from pockets for catching stones; (3) flexible traction and steering mechanism on underside of carbody; (4) one-piece carbody, high carbon steel casting; (5) operating machinery and power compactly grouped for maximum accessibility.—**Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis.**

"We're Low Bidders Again- Pumpcrete Brought Us Another Profitable Job!"

● It's not surprising that more and more frequently, the winning bidders for profitable concrete jobs have based their concrete placement figures on the performance of Rex Pumpcrete. For Pumpcrete, by eliminating the need for towers, buggy runs, buckets or hoists, and by giving consistent delivery of from 15 to 65 cubic yards of concrete into the forms every hour, cuts placement costs to new lows.

Pumpcrete can help you get more jobs and do them at a better profit, as it has helped one prominent midwest concern. This company, when preparing their bid for a $2,500,000 high school, compared the cost of using ordinary methods to place 15,000 yards of concrete into light-sectioned beams, walls, floors and roof, as against the cost of doing it with the Rex 160 Pumpcrete. Result: *another Pumpcrete job and another profitable seventeen months' work for the bidder!*

There are Pumpcretes built for all classes of concreting work, for jobs of 500 yards or 100,000 yards of concrete or more. Before you bid, see how they will help you outbid the field!

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PROCESS—GIESE • SYSTEM—KOOYMAN

REX PUMPCRETE

With the Pumpcrete pipe line suspended from the girders, the placement of concrete in the floor slab goes on at a faster pace, unobstructed by buggy runs, hoppers, etc., on this high school job.

SEND FOR your copy of "Concrete By Pipe Line." This complete Rex Catalog tells the whole story of the use of Rex Pumpcrete on jobs like the one mentioned above. Use the handy coupon.

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1664 W. Bruce Street, Milwaukee, Wisconsin
Please send me my copy of "Concrete By Pipe Line"

Size of Job ..... *(Yds.)*
Pouring Time .....
Firm Name .....
By ..... *Title* .....
City ..... *State* .....
Address .....

SERVICE Construction SECTION
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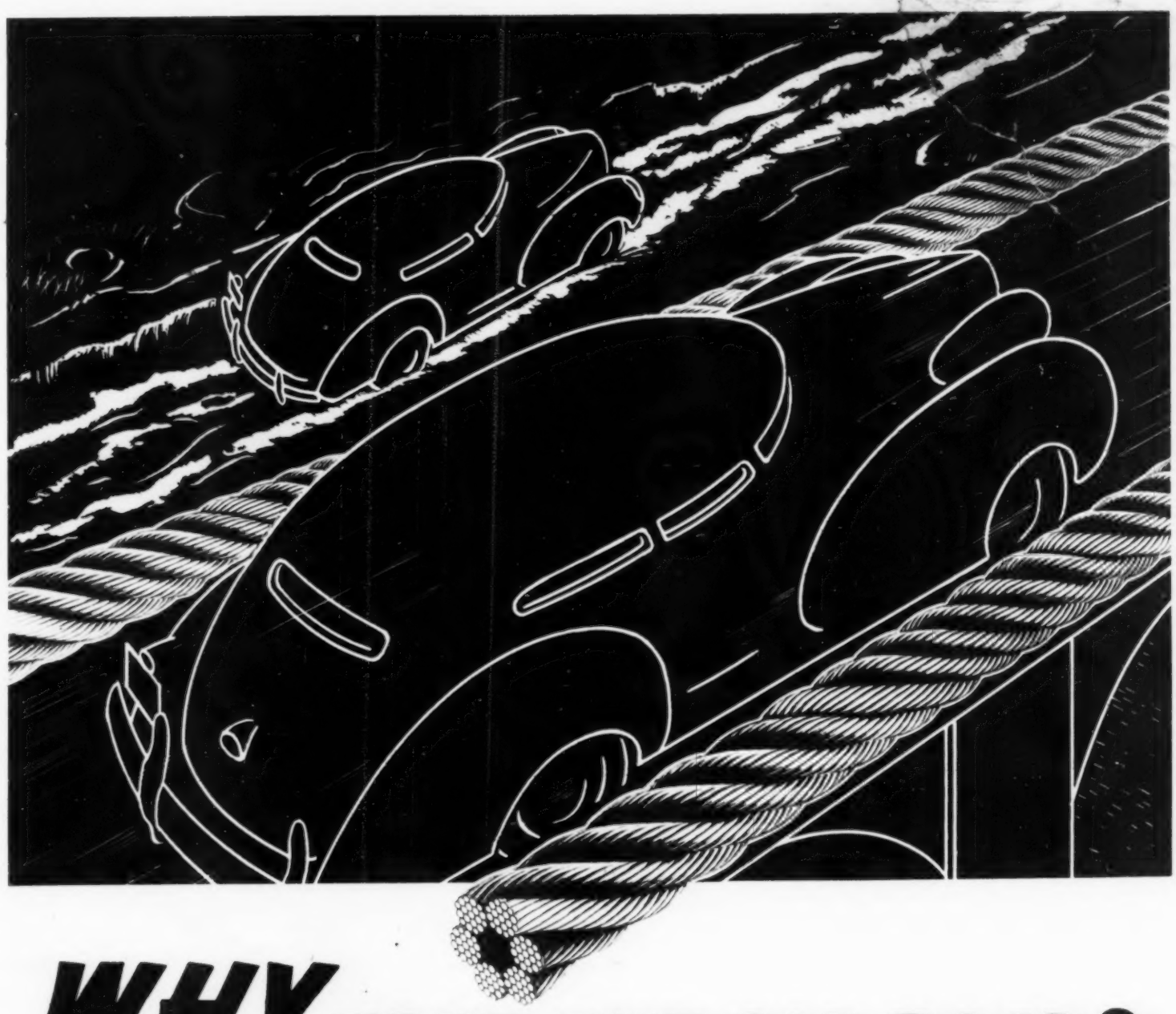

WHY TAKE THE OLD ROAD?

LAY-SET Preformed is as much improved, for many applications (over the wire ropes of 1926), as the smooth stretch of concrete is better than the mud-ruts of yesteryear. With LAY-SET Preformed available, the use of non-preformed wire rope on your machine is like purposely choosing a bumpy, slow-moving detour when driving. LAY-SET Preformed wire rope assures your machine smooth, less-interrupted going. It works faster, easier, safer, *longer.* It resists kinking and whipping. It is the highway to greater-dollar-value. LAY-SET Preformed both fills the bill and cuts it down. *All* Hazard wire ropes made of Improved Plow Steel are identified by the Green Strand.

BUY ACCO QUALITY *whether for Hazard Wire Ropes —American Chains (Weed Tire Chains—Welded or Weldless Chain)—Campbell Abrasive Cutting Machines—Page Chain Link Fence—Page Welding Wire—Reading-Pratt & Cady Valves—Wright Hoists or any other of the 137 ACCO Industrial Products.*

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Old "L" no. 1 hits Beefsteak Trail

JACK CARLSON SHORTENS CATTLE ROUTE FROM CENTRAL IOWA FEED LOTS TO SOUTH OMAHA STOCK YARDS ..PROVES LONG LIFE OF FASTER POWER

L no. 1 and supporting cast of WK tractors.

An L-O, Carlson's latest faster-powered tractor, and a Gar Wood L-12 scraper opening a new cut.

Out in Central Iowa, near Griswold, Contractor Jack Carlson recently completed the excavating that will connect State Highway 100 with No. 2, make it the shortest fast truck route from west central Iowa to South Omaha's great stockyards. In the Allis-Chalmers fleet on that job was veteran Model L no. 1, the tractor that first demonstrated to contractors the profit possibilities of FASTER POWER. Said Carlson: "L no. 1 is still going strong after seven years of hard service and has moved more than 1,000,000 yards of dirt." FASTER POWER has paid him well, so well that his fleet now numbers 12 Allis-Chalmers tractors.

Put this cost-cutting power on YOUR job. Watch it take big loads and pass up slower-moving rigs, travel back to the cut at speeds up to 6.41 m. p. h.! (L's and L-O's travel 564 feet per minute or nearly 100 feet faster than ever before possible with a big tractor.) This extra speed, plus A-C's quick pick-up and fast maneuvering ability, add extra yards to your daily output . . . will enable you to dig more profitably . . . will pay you dividends for years to come. *Ask your Allis-Chalmers dealer to show you.*

ALLIS-CHALMERS

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POWER

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